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SUMMER RAMBLES.

The following is a list of the principal places of interest in the vicinity of Middletown, showing the more important mineralogical and botanical localites. It may prove useful in planning Saturday tramps or evening walks.

WESTFIELD FALLS. Five miles N. W. of the college. A romantic cascade of 50 feet, plunging over a precipice of trap.

LAMENTATION MOUNTAIN. On the N. side of the Meriden Pike, six miles W. of the college. A lofty eminence in the trap range, commanding a prospect of the sound on a clear day.

MIDDLEFIELD FALLS. Four and a half miles S. W. A beautiful fall of 40 feet, situated on the Arrowmamett, in the town of Middlefield. It is approached by a path leading for a mile along the bank of the creek, or by a carriage road. Minerals. In the cavities of the trap rock, over which the water falls, are found fine specimens of Datholite, also Olivine, Prehnite and Chlorite.

COOKE'S FELDSPAR QUARRY. On the Haddam pike, three miles S. E. of the college. Minerals. Feldspar, (which is used to make enamel for earthenware,) Albite, Garnet, Beryl, Columbite, Black Tourmaline, Magnetite, occasional Apatite, Rutile, and Uranite.

WHITE ROCKS. Two and a half miles S. E. of the college. A bare ledge of rocks, in the granite hills, commanding a fine view of Middletown and the surrounding country. Minerals. Here and in the immediate vicinity, Albite, Feldspar, Beryl, Garnet, Columbite, Magnetic Iron, Pyrites, Lepidolite, Black, Green and Red Tourmaline. Rare Plants. Ladies' Slipper, (Cypripedium acaule), Wake Robins (Trillium erectum and T. cernuum), Bellwort (Uvularia perfoliata), Wild Sarsaparilla (Aralia nudicaulis), False Spikenard (Smilacina racemosa), Blood Root (Sangumaria Canadensis).

SILVER MINE. On the bank of the Connecticut, three miles S. E. of the college. It was worked by the colony for lead from 1775 to 1778, with the hope that it could be obtained in sufficient quantities for military purposes. It is said that the bullets used in the battle of Saratoga were made in a small red house still standing near the mine. The vein which was worked extended northward, toward the river, and was found to be very rich in places. It has since been used by speculators as the basis of a stock company enterprise, and as it furnishes a few good specimens, though no ore in any amount, it paid pretty well. Minerals. Argentiferous Galena, Antimonial Sulphuret of Silver, Copper Pyrites, Zinc Blende, Fluor Spar. Quartz in fine drusy crystals. Occasional, Sulphuret of Bismuth, Arsenical Iron Pyrites. About a mile south of the Silver Mine, on the river side, is a quarry, where is obtained the stone for the Belgian pavement now being laid on Broadway, New York.

BODKIN ROCK. On the east bank of the river, nearly opposite the Silver Mine. This is a sharp point of rock, jutting out into the river at the commencement of the narrows, containing a quite commodious cave. A pleasant row from the city. Minerals. Garnets imbedded in Albite, Beryl, Columbite, Black Tourmaline, Prase. Rare Plants. Near here stands a solitary specimen of the M. macrophyla, of the southern states. On the rock grows the beautiful Bud-foot Violet (V. pedata).

COBALT MINE. At the foot of Great Hill, in the town of Chatham, seven miles S. E. of the college. It may be reached either by land or by rowing to Middle Haddam, six miles, and walking the remaining two. This mine was opened in 1762, by a company of Germans. Much ore was sent to England, Holland and China, but as all the parties concerned were foreigners, nothing is known of its character or value. It was finally abandoned in 1787, when tradition says that Gonimus Erkelius, one of the proprietors, sailed for China with twenty tons of Cobalt ore. In 1818 mining was recommenced. The person who undertook it knew nothing about his work, and having expended about $20,000, he obtained one thousand pounds of ore which he supposed to be Cobalt, but which proved to be nickel, containing only three or four per cent of the desired metal. It was then given up until 1850, when another company began operation and put up the buildings which still stand. After spending $150,000, they also abandoned it without obtaining half a pound of Cobalt. The shaft which now remains open extends into the side of the mountain about thirty-five feet. At its extremity can be obtained specimens of Cobalt and nickel ore, but it is dangerous to enter.

Chi Psi Glen. One mile south of the college. A pleasant ravine, boasting a fine cascade. A locality of that universal favorite, the Trailing Arbutus (Epigaea repens.)

The Ravine. One-fourth of a mile south of the college. Another locality of the Arbutus.

The Lover's Walk. A romantic gorge in the midst of the factories at the south end of South Main street. On the dam at its eastern end grows the rare Fly Honeysuckle (Lonicera ciliata.)

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THE COLLEGE ARGUS.

Wesleyan University, Middletown, Conn.
Thursday, May 27, 1869.

MUSCA ET MEDICA.

VERILY, Mr. Editor, there is nothing new under the sun. Will you allow me through your columns to give to the world the following extract, which I conceive to throw much light upon the two great questions of the day. It is translated from an ancient Greek manuscript found at Herculaneum, descriptive of the manners of Ancient Greece. “As we parted with the philosopher Ariston, Lasthenia asked after his fly, and whether he sometimes saw it, ‘No’ replied he ‘Agnodice has delivered me from it forever.’ When we were alone, I asked Lasthenia to explain this allusion, ‘you must have perceived,’ replied she “that this old man bears the stamp of singularity. He has told you that during five years he wore himself out with constant application. Whenever he wished to study he laid down on his belly upon the ground surrounded with books, and at these times imagined he saw a fly light upon his nose. Notwithstanding his constant endeavor to drive it away, it still returned and thus threw him into despair! The most skillful physicians were consulted, but their learning, and their remedies were unable to remove this daughter of heaven, as one of our poets has called it, from the nose or rather the imagination of Ariston.

At length the celebrated Agnodice had the honor of performing the cure. This Agnodice was a woman of great talents and had so strong a passion for the study of medicine, that she disguised herself in a man's clothes to attend the lectures of her father Hierophalus. The ladies of Athens were so enthusiastically fond of this female physician, that on her account they procured the abrogation of the law which prohibited women from the exercise of that profession. This extraordinary woman being consulted by one of Ariston's friends, undertook to relieve him from the importunity of the fly. She no sooner saw her new patient than he asked her what he had upon his nose. 'A fly' replied Agnodice boldly, and having by this artifice gained the confidence of Ariston, she proceeded to inquire, with the grave and sagacious air of a physician, the origin and symptoms of his disorder, the habits of this pertinacious fly, and at what hours it came and went, she then ordered him draughts that were perfectly innocent and having continued these several days, she at last informed him that she was about to extirpate the fly. Upon this she took a knife from her pocket, drew it gently over his nose, and immediately showed him a fly which she had concealed in her hand, 'yes, there it is,' cried Ariston 'I know it well, it is the very same that has so long tormented me.' Thus did this disciple of Æsculapius cure the philosopher of his phantasm, and so true is it that most of our pains as well as our pleasures depend on the imagination."

Your constant reader,

Coll. Argus III. 149
Mar 2. 1870

Antiquarius.

COLLEGE MEN IN CONGRESS.

Up to 1864 there had been 847 college bred men in Congress. They are distributed as follows. Yale, 138. Harvard, 118. Princeton, 108. Dartmouth, 60. Univ. of N. C, 40. Brown, 35. Univ. of S. C., 32. Union, 30. Bowdoin, 23. Univ. of Va., 18. Dickinson, 17. Columbia, 15. Wm. and Mary, 14. Williams, 13. Univ. of Ky., 11. Univ. of Pa., 10. Univ. of Vt., 9. Washington (Pa.,) Jefferson and West Point Mil. Acad., 8. Miami, Hamilton and Franklin, 7. Univ. of Ga., Amherst, Middlebury and Hampden Sydney, 6. Rutgers and Centre, (Ky.,) 5. St. Johns, (d.,) 4. Univ. of Ala., U. of E. Tenn., Wesleyan, Waterville, Washington, (Va.,) Georgetown, Lafayette, Ohio State Univ., 3. Charlestown, Trinity, Washington, (Md.,) Randolph, Macon, St. Marys, (Md.,) Indiana Asbury, Washington, (Me.,) Mt. Zion, and Kenyon, 2. Univ. of N. Y., Univ. of Mich., Emory, Western Reserve, Oberlin, Wabash and twenty-two others, 1. The Universities of Geneva, Switzerland., Caen, France., and Glasgow are each represented by one.

Coll. Argus. III 12,
May 4. 1870

HISTORY OF WESLEYAN UNIVERSITY.

G. BROWN GOODE, IN COLLEGE REVIEW.

Chapter 1.

On the 12th of September, 1825, the "American Literary, Scientific and Military Academy" at Middletown, Conn., was formally opened to the public. This institution was established by Captain ALDEN PARTRIDGE, the first Superintendent of the U. S. Military Academy at West Point, who, becoming dissatisfied with his treatment there, decided to found a smaller school on his own account. Having obtained the sanction of several prominent citizens of Middletown, he settled upon that as the site of his school, and through the munificence of the citizens suitable buildings were erected at a cost of $44,000. The institution was a time very prosperous, and cadets were in attendance from almost every State in the Union. Many distinguished men received their education here, among whom may be mentioned the late Gov. T. H. SEYMOUR, of Connecticut, and the Hon. HORATIO SEYMOUR, of New York, and many took prominent parts in the late rebellion, especially on the Confederate side. Failing, however, to obtain from the Legislature a college charter it was removed to Northfield, Vt., where it still exists under the name of the Norwich University. The buildings now reverted to the donors, and remained for some time unoccupied.

One day, some of the stockholders being together, a gentleman expressed some surprize at the energy and public spirit of the Methodists in Middletown, in the recent erection of a large and commodious church, and laughingly remarked that he would not be surprised if they should next think of establishing a college. To carry out the idea, another sportively added that they had buildings to dispose of which might be had for $5,000, provided they would establish a classical school of high order on the premises. This trifling conversation was the immediate cause of the establishing of the Wesleyan University; It was reported to the Rev. LABAN CLARK, who was then in the vigor of his ministry and the Presiding Elder of a district which reached over half of Connecticut.

In common with the other leading men of the Methodist Episcopal Church, he had long been impressed with the importance of a grand denominational school, and was nothing disheartened by the sad history of the previous attempt at Abringdon, Md., which had been finally abandoned in 1795. He immediately sent word to the stockholders that he would be one of ten to purchase the property, and would secure the other nine, seven of which he did secure before he had gone once around his district. This led to a serious consideration of the subject, the result of which was that the stockholders determined to give the property to the M. E Church, if they could be assured that the college would be permanently established. Mr. CLARK, having been entrusted with this offer in due form, presented it to the New York Annual Conference at its session at Troy, N. Y., in 1829, and used to tell a good story concerning the introduction of the business. He had informed Bishop ROBERTS of his intention to present the subject to the Conference, and when the body had been in session several days the said, "Now, Brother CLARK, you may speak to the Conference about the school at Middletown, although I am sorry that so many of the preachers are out of doors."

Mr. CLARK replied, "I will soon have them in, sir, if some one will open those doors." The church doors being opened Brother CLARK cried out at the top of his voice, "Thirty thousand dollars! Twenty thousand dollars!" and instantly the good brethren gathered in like a flock of sheep, and gave their closest attention to the business in hand. The establishment of a college having been for some time in contemplation, they were readily induced to appoint a committee to confer with a like committee from the New England Conference. The first act of the joint committee was to issue proposals inviting the several towns within a specified region to compete for the location of the college by the offer of subscriptions. Troy, N. Y., Wilbraham, Mass., and Bridgeport, Conn., made liberal proposals; but those from Middletown were now so modified as to leave no room for hesitancy as to which should be preferred. The trustees of the academy, with the consent of the stockholders, offered the entire property to the Conference in fee-simple, with the single condition that it should be sustained as a college or university, besides giving a local subscription of $18,000 if $40,000 additional endowment should be obtained. In this way fifteen acres of land, large, commodious and substantial buildings, and the nucleus of a library were placed at once in their hands. The report of the committee in favor of Middletown was adopted at the next session of the Conference, and the name of WESLEYAN UNIVERSITY agreed upon. Other Conferences came immediately into the measure, and active work was begun August 24th, 1830, by the election of Rev. WILBUR FISK, D. D., to the presidency. It was thought by some that no American Methodist was qualified to take charge of such an institution, and it was proposed to call from England, Dr. ADAM CLARKE, the celebrated biblical scholar and author of "Clarke's Commentary," but more practical views prevailed. In the following October a preparatory school was commenced under the care of Rev. W. C. LARRABEE, a graduate of Bowdoin. In 1831 a charter was granted by the Legislature securing all the rights and immunities of a university, and on the 21st of September the halls were thrown open for the reception of students, the occasion being celebrated by appropriate literary ceremonies. The first student who unpacked his trunk in the rooms of the new college, was OSMUN C. BAKER, of Concord, N. H., now a bishop; and among his associates in those early days were the late ABEL STEVENS, the historian of Methodism; Bishop CLARK, Col. T. B. THORPE, of New York; Dr. PATTEN, of Boston Theological Seminary; Dr. KIDDER, of Chicago; Dr. B. F. TEFFT; Dr. CURRY, of New York; Dr. Wentworth, of Troy; President E. E. WILEY, of Emory and Henry College; JOHN G. SAXE, the poet; Dr. E. O. HAVEN, of Michigan University, and many others who have since risen to eminence in the church and in literature.

Dr. FISK held his office until his death in 1839, and to his untiring labors in its behalf the university owes its prosperity and influence.

His name was sufficient to attract a larg number of students at the very beginning, and his energy and skill secured that financial aid which at that time was much less attainable than now.

At the organization of the University, in accordance with the peculiar views of Dr. FISK, which he shared with Presidents WAYLAND, of Brown University, DURBIN, of Dickinson College, and Marsh, of the University of Vermont, in place of the usual college classes, the progress of the student and his ability to pass the vigorous examinations required, were the only grounds of classification; the student who could pass the examination for the degree of A. B., received his diploma without reference to the time spent in college. This system was maintained for some years, but has gradually fallen into disuse, as it has also at Brown University, where it was for a time in successful operation. The regular college classes are now maintained, though a student taking a special course of English studies passing a satisfactory examination may receive the degree of S. B., or students may take a select course without receiving a degree. But by far the greater number go regularly through, as in other colleges. During Dr. Fisk's administration a manual labor department was established, which, however, met with little encouragement; a commons or boarding hall was also maintained during the first twenty years. The first faculty consisted of the President, two professors and one tutor, and the first class consisted of six members, of whom three now survive, graduated in 1833.

In 1841, Rev. Nathan Bangs, D. D., was elected President, but resigned in 1842 and was succeeded by the Rev. Stephen Olin, D. D., L. L. D. Dr. Olin's presidency was a prosperous one for the University, and through his exertion a heavy incubus of debt was thrown off and the endowment largely increased. Although in very poor health, his influence was great and still is felt. He died in 1851, and his remains repose by the side of those of Dr. Fisk in the beautiful college cemetery.

During this period a law department was established, and for a time continued under the care of Hon. WILLIAM L. STORRS, Judge of the State Supreme Court; also a department of normal instruction. During Dr. FISK's administration arrangements were also begun for the establishment of a medical department, but the project was postponed and has not been yet resumed.

HISTORY OF WESLEYAN UNIVERSITY.

G. BROWN GOODE, IN COLLEGE REVIEW.

Chapter II.

In 1852, Prof. AUGUSTUS W. SMITH, LL. D., who had been a professor in the institution from its very infancy, was elected to the Presidency. It was a novel move to place a layman in this important position, but Prof. SMITH was a hard worker and filled the chair with ability. He was subsequently professor in the U. S. Naval Academy, and is well known as an author of mathematical text books. The great event of his administration was the raising of an endowment fund of $100,000. ISAAC RICH, of Boston, was the chief contributor to this fund, making at this time the first of his princely donations to the University. President SMITH resigned in 1857, and was succeeded by Rev. JOSEPH CUMMINGS, D. D., LL. D., President of Genessee College, who has filled the place up to the present time with distinguished ability and great success. Under his administration important changes have been introduced in the course of study, the elective system having been adopted to a certain extent; the endowment fund has been nearly quadrupled; several new buildings have been erected, and the value of the property, over and above indebtedness, raised to over $650,000. It would be a severe blow to the University if the church should call him to a position of more honor, if not of more responsibility.

The library has been formed around a nucleus of 508 volumes, which belonged to the "Military Academy." In 1832 it numbered 2,750 volumes, having been enriched by the collection of THOMAS CHAPMAN, Esq., of Philadelphia, which was a fine one for the times, and was peculiarly rich in rare editions of standard authors. In 1835 it numbered 5,000 volumes, and in this year was also enlarged by a collection of classical and scientific works purchased by Dr. FISK in Europe; in 1839 it numbered 9,000; in 1840, 10,000; in 1845, 11,000; in 1848, 12,000; in 1853, 13,000; in 1864, 14,000; and in 1867, 15,000 volumes. By the conditions of the gift of the new library building, in 1866, the Alumni were required to raise the sum of $25,000 for a permanent library fund; $27,000 was raised, and the income of this has become available within the last three years. The library is now rapidly increasing and contains between 19,000 and 20,000 volumes. The "Odell Alcove" of American History is the commemorative gift of the friends of the late Hon. MOSES F. ODELL, of Brooklyn. It is intended to be complete in its department, and numbers 3,000 volumes and is rapidly increasing.

The library of Rev. JOHN SUMMERFIELD, was presented by his brother-in-law, Mr. BLACKSTOCK, and now fills the "Summerfield Alcove."

The Museum of Natural History is to occupy rooms in the new scientific building, and when arranged will compare favorably with any in the country. Besides the extensive collections made in the vicinity by members of the institution, it includes a cabinet of minerals and fossils formerly belonging to the "Literary, Scientific and Military Academy," the Prescott Cabinet of New England shells, minerals and rocks, the Frankfort Cabinet of American and foreign minerals, and the Shurtleff Cabinet which has recently been purchased. This was collected by the late SIMEON SHURTLEFF, M. D., of Simsbury, Conn., and includes a collection of shells—one of the best in New England, containing about 80,000 specimens of 8,000 species, a collection of birds, native and foreign, with a large number from the Pacific railroad survey, a collection of insects, &c., &c.

There are many minor collections, some only large enough to serve as *nuclei* for future acquisitions, also a herbarium of several thousand specimens. The ethnological cabinet of the "Missionary Lyceum," and the collections of the "Cuvierian Society" have recently come into the possession of the University. Mr. ORANGE JUDD has just completed negotiations with Professor WARD, of Rochester, N. Y., for a very complete set of his casts of fossils, at a cost of $3,500.

A temporary observatory has been erected, sufficiently commodious for present use, in which has been placed, by the munificence of three citizens of New York, a twelve-inch refracting telescope, made by ALVAN CLARK, of Cambridge. This ranks third among the telescopes of America, and fourth in the world, and is considered by its maker equal to the best for practical purpose. It is the largest to which the students of any university have free access. The observatory and chemical and philosophical lecture rooms are furnished with necessary apparatus, mostly of London and Paris make.

The University is located on the crown of a high hill on which is built the beautiful city of Middletown, and overlooks the city, the Connecticut river, the extensive Portland quarries, and much of the surrounding country. The grounds are extensive and well planted with trees, and are soon to be laid out anew by the landscape gardener. The leading buildings stand in a line north and south, facing easterly, leaving a broad campus in front descending to High street, with the President's house in the north-east corner. Beginning at the north we have the old college building or dormitory, erected in 1825, and which is soon to be remodeled and modernized; next south the old chapel building, erected in 1825, and now used for recitation rooms; next the memorial chapel, erected in 1868, then the RICH Hall, erected in 1867, and containing the library, and next the ORANGE JUDD Hall of Natural Science, erected in 1870. In a rear line stand Observatory Hall, erected in 1825 and remodeled in 1868, containing at present the cabinets and natural history recitation rooms, besides a number of student's apartments; the gymnasium, erected in 1865, and the old laboratory and work shops. All are of "brown stone" except Observatory Hall, which is brick, and the gymnasium which is a frame building.

In front of the main building stands the "Class Maple," around which on Class Day —the great day of the collegiate year—the graduating class gather on the green sward, and having smoked the "pipe of peace," according to the old time-honored custom, sing their parting songs and say their sad farewells.

The Alumni of the University now number 948, of whom 814 are still living. Of the whole number 419 are ministers, 149 are lawyers, and 55 physicians; 37 have been college presidents, and 82 college professors. Statistics show that the Wesleyan University has furnished a larger proportion of teachers than any similar institution, giving an average of twelve years of teaching for each alumnus, including the youngest; 158 were engaged in the late war, of whom 18 lost their lives. The beautiful Memorial Chapel commemorates the heroism of these noble men.

Owing partly to the number of preachers among the alumni and students, and partly to the fact that there is an Episcopal theological seminary in the city, the idea is held by some that Wesleyan is a theological school. It is quite needless to state that this belief is without foundation, as there is no such school nearer than Boston. The faculty consists of the president, eight professors, and two lecturers. All of the regular professors, except two, are graduates of the institution. Dr. JOHN JOHNSTON is a graduate of Bowdoin and has been connected with the institution from the days of its infancy. He is well known as an author of text-books on natural science. Prof. J. C. VAN BENSCHOTEN received his degree from Madison University and subsequently studied at the University of Berlin.

A new chair of natural science was endowed by Mr. ORANGE JUDD at the last Commencement, but it has not yet been filled.

The tuition fees are merely nominal, and it is proposed, as soon as possible, to make the institution free to all. Scholarships, entitling the holder to tuition for fifteen and fifty years, may be purchased for $50 and $100 respectively.

The institution is open to all, irrespective of color; a negro graduated in the regular course with the class of 1860, and a Japanese enters this year; it is even doubted whether women would be refused admission, as there is nothing in the laws or charter to prevent their entering.

The governing body of the University, according to the amended charter, which passed the Legislature at its last session, is a Board of Trustees, whose legal title is "The Wesleyan University." The number of Trustees is limited to forty, of whom the Patronizing Annual Conferences of the Methodist Episcopal Church, namely, the New York, New England, New York East, Providence, New Hampshire, Vermont, Maine, East Maine, Troy, Central New York, Black River, Newark and Wyoming have the election of one each. The alumni of three years standing elect five, and the remainder are elected by the Board of Trustees. The Trustees hold their office for five years, and are divided into five classes, one of which goes out each year. The President is *ex-officio* on the Board.

The Wesleyan University is perhaps the oldest of the Methodist colleges. While perhaps a little discomposed at so often "having her nose put out of joint," and while deprecating the possible financial result of the present policy of the M. E. Church in its educational system, she looks with an affectionate pride upon her forty-two younger sisters, each of whom she hopes yet to see occupying a place in a future number of THE COLLEGE REVIEW.

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OUR MUSEUM.

The work of classifying and cataloguing the various cabinets is being pushed rapidly forward, and if, as is confidently expected, the new rooms in Judd Hall are finished by the 10th prox., the specimens will be in their places on the shelves before Commencement. Heretofore the size and value of our collections have been little appreciated. Specimens have been preserved in at least ten different appartments, many of them in closed cases or otherwise inaccessible to the student, while the Professor in charge has been obliged to organize an exploring expedition whenever specimens were required for the illustration of lectures. Mostly without labels and uncatalogued, a large portion of the collections has been of no practical value whatsoever.

With 1871 begins a new era in the history of our Museum. When systematically arranged in Judd Hall, every specimen will be available, and a well-proportioned growth will for the first time be possible. Though it will fall far short of what is requisite, and though it cannot be mentioned in the same breath with those Museums which are considered indispensable in the Universities of Europe, it will compare favorably with those of most of our sister colleges.

The deficiencies in our collections are apparent to the most casual observer. Take for instance our faunal or local collection. A series of all the animals of New England is one of the things indispensable in our Museum, and one might suppose, would be easily obtained. Yet in our case it is not so. Of the forty or more mammals, only seventeen are respectably represented, such common species as the raccoon, fox, skunk, woodchuck and chipmunk being wanting. Of the three hundred and fifty birds, the Shurtleff collection gives us a tolerable full series deficient only in the rarest and most common species. Of the sixty reptiles and amphibians we have but twenty-two. About two hundred species of fishes inhabit our waters while only thirty-two species inhabit our alcohol in the museum jars. Of the insects we have but a tithe, between one and two thousand species, of the spiders and worms almost none, of the crustaceans, twenty out of eighty. Thanks to Dr. Shurtleff, our collection of shells is quite complete. So much for the local collection. The vacancies in other departments are quite as appalling.

Now the students and friends of the college have it in their power to aid materially in the increase of our collections, and that with very little trouble to themselves. There are few persons who will not, during the coming summer, meet with valuable specimens. Let them collect what they find, and the result will be very apparent at the end of the season. Mammals, birds, birds nests and eggs, frogs, snakes, salamanders, turtles, fishes, skeletons and bones of every description, especially skulls, insects, "bugs" spiders worms, crabs, star fish, sea anemones, vegetable productions of every kind, fossils, minerals—nothing can come amiss. If specimens of the same are already on hand, the duplicates will be serviceable for study or exchanges. Especial attention is called to the department of Archæology and Ethnology. This is already of promising size and contains many valuable specimens. Anything throwing light upon the history of the Indians of Connecticut is especially desirable. Contributions to the collection of coins are solicited. A careful record is kept of each donation, and the name of the donor attached to the specimen when practicable. A list of the donations will be occasionally printed in the ARGUS.

A word as to the preservation of Zoological specimens. When possible they should be brought to the Museum in a fresh state, but if at a distance any but birds, moths, and butterflies may be put into spirits. Any animal may be easily killed by the use of chloroform or benzine. The locality and date of collection should always be carefully noted.

The following donations have recently been made to the Museum.

DR. J. BARRATT—Collection of native birds—50 species, 100 specimens.

DR. G. W. BURKE—Specimen of quartz crystal.

MRS. S. T. CAMP—Specimens of *Pinnotheres ostreum.*

F. C. GOODE—Virginian opossum, crawfish &c., in alcohol, Knoxville, Tenn.

M. E. Griffin—Indian hatchet, Middletown.

M. P. Hatfield—Collection of native insects.

P. Jewell, Hartford, Ct.,—Suite of specimens of native sulphur and associated minerals, Girgenti, Sicily.

Miss. S. F. Judd—Specimens of beetle, (*Copris*,) Flushing, N. Y.

G. H. McGrew—Specimen of Tourmaline, Middletown.

T. R. Mercein—Collection of native insects.

S. Miner—Clay concretion, Middletown.

H. G. Newton—Quartz arrow head, Coginchaug Swamp, Durham.

C. Raymond—Specimen of *Sciurus carolineus*, *Melospiza melodia* and *Quiscalus versicolor*.

J. E. Richards—Myological preparation of human arm, Bellevue Medical College, N. Y.

A. B. Sanford—Specimen of weasel in winter dress, Redding Ct.

N. J. Squires—Pectoral fins of flying fish.

M. L. Taft—Specimen of tailless cat, Vermont.

J. VanBenschoten—Specimen of *Sialia sialis*.

M. W. Van Denburg—Collection of native insects, bird skins, 3 species 4 specimens.

C. T. Winchester—Piece of rebel ram "Merrimac."

G. Brown Goode.

Zoological Museum Mar. 11, 1871.

RAMBLING.

> "When we please to walk abroad
> For our recreation,
> In the fields of our abode,
> Full of delectation."
>
> *Waltons Complete Angler,*

Books and cares are thrown aside this fine April day, and with light hearts and thick boots we are off for a morning ramble. Tree-buds are swelling, grassy banks are brightening, and the birds are sounding the first notes of the overture which ushers in the grand spring jubilee. All traces of frost are gone, and the hard turf by the roadside makes easy walking, though the wagon-track itself is still a red morass. How the spring rains bring out the color of our soil. Herr Frauenhofer with his Spectroscope has overturned the hobby of those astronomers who believed the fiery hue of Mars to be caused by a red sandstone soil like this. A brisk walk of fifteen minutes has brought us to that well known spot, the Students Glen, a delightful little retreat when we first knew it, but now well nigh spoiled by the "advance of civilization." A new cemetery on one side and a mill pond on the other, have destroyed that air of seclusion which in former days gave it its chief charm. Yet it is still inviting, with its miniature cascade, its rocky, moss-covered banks, its fern clumps and its thickets.

On yonder slope grows that universal favorite, the Trailing Arbutus. These warm sunbeams must certainly have enticed open some of the early buds. A spasmodic scramble over the stepping stones, at the cost of a pair of wet feet, and then we slowly clamber up the rocky bank. To be sure, here are the little buds modestly opening their fragrant pink petals beneath the carpet of dry leaves.

Aside from its beauty, this little friend has for us a historic interest. Peeping through the snow, it gave the earliest tidings of Spring to our Pilgrim Fathers at the close of their long and perilous first winter on the Plymouth shore. With joy and thanksgiving they christened it, after their trusty vessel, "The Mayflower," and to this day, its name gives it an additional charm to every true New Englander.

See, we have started from that patch of low ground several beautiful butterflies. For a few moments they flutter about, and then settle again in some sheltered spot. There is one lazily spreading his wings on the dry oak leaves, not six feet away. His color is dark, velvety purple with a broad border of white edged with black and brilliant blue. It must be the Camberwell Beauty, for no other butterfly comes out so early in the season. It is hatched late in the Fall and passes the winter in a semi-torpid state in barns and stone-heaps, where it is frequently found huddled together in great numbers. At the first sign of approaching Spring it ventures forth, and may be seen, even as early as February, flitting through the woods with weather-beaten wings. It is a native of Europe, and has probably been introduced here. Fifty years ago it was abundant in England, but is now extremely rare, and the capture of a specimen is announced in the scientific journals as a remarkable occurrence. There! it has disappeared, though we have not moved our eyes from the spot where it was resting a moment ago. No, there it is. Now it is gone again. Ah! I see, it had folded its wings over its body, and their under surface is so like a dry leaf in color, markings and form that it nearly escaped our notice. Truly, this is a wonderful provision for the safety of an insect, otherwise so conspicuous.

There, by that stone heap, is stretched a young garter snake, his gorgeous golden stripes glistening in the sun. Take him up gently and let us admire him. Do not shudder so when he coils about your wrist; he makes a pretty living bracelet, and you know well that he is perfectly harmless. His eyes vie in brightness with those of any belle of Middletown.

Let us overturn this large stone on which we are resting; underneath, I am sure, is a fine menagerie for our amusement. Just as I hoped. The first object which strikes the eye is a salamander, beautifully banded with dark blue and greenish white; the fasciated salamander so rare in New England. Not the fabled salamander who

> "with her touch
> Quenched the fire, though glowing ne'r so much."

whose venom was more deadly than aconite or hemlock; whose saliva had "power to remove hair and substitute bald places for luxuriant tresses," and whose skin could transmute quicksilver to gold, but a harmless little being whose whole life is passed in just such places as this. I remember seing one which had been transferred from its woodland home to an aquarium tank, where it lay floating like a log on the surface of the water, the very picture of misery. Here, too, are several centipedes; not venomous, but otherwise perfect miniature editions of their troublesome tropical cousins.

Here is an earthworm, an every day sight, yet none the less amusing and instructive. Hear honest old Izaak Walton discourse in his quaint, delightful style on worms and their origin. "For worms there be very many sorts, which for color and shape alter even as the ground out of which they are got; as the *dew-worm*, the *lob-worm*, the *marsh-worm*, the *tag-tail*, the *oak-worm*, the *gilt-tail*, &c., too many to name, even as many sorts, as some think there be of birds in the air. *Pliny* holds an opinion, that many have their birth or being from dews that in the spring fall upon the leaves of trees; all which kinds of dews being thickened and condensed, are by the sun's generative heat most of them hatch'd and are in three days living creatures, and of several shapes and colors; some being hard and tough, some smooth and soft; some are horned in their head, some in their tail, some have none; some have hair, some none; some have sixteen feet, some less, some none," &c., &c.

"Heresy," cries the theologian, "were not all creatures made directly by the hand of God?" Softly! honest Izaak Walton was as sound a theologian and, we believe, as sincere a Christian, as you will find in many a day; yet he did not consider it derogatory to the power of God to suppose him working by means of fixed laws. The theory of Spontaneous Generation was admitted by the theology of the seventeenth century. Our theology is the same as in A. D. 1653. The philological discoveries of the past two centuries, and the consequent improvements in Biblical exegesis have affected it but little. Job's exclamation, "I know that my Redeemer liveth, and in my flesh shall I see God," still stands in our burial service as a proof of the resurrection of the body; when we all know that it should be translated "and without my flesh shall I see God." Science proved spontaneous generation an impossibility, and Theology now therefore virtually

STRAY GLIMPSES AT OLD HARVARD.

Cambridge is a model university town; in a spot peculiarly favored by nature, art has left little to be desired, and the broad, quiet, elm-arched streets, the tasteful pleasant homes, the very people you meet, bear that air of culture and refinement which is found only near long-established seats of learning. Here, we need hardly say, is Harvard College. Founded in the early days of our colonial history, it copied the main features of the great English universities, and although the old laws and customs are mostly gone, sufficient traces remain to give to "Old Harvard" and to its student life a peculiar stamp of their own.

A stranger is impressed by the quiet and order which prevail in the class-room, on the campus and in the street. As in the European universities, this results from the large number of students. At an institution so undemocratic as Harvard, in a class numbering two hundred or more, where the student has hardly a speaking acquaintance with half his classmates, "class spirit" and class combinations are things unknown. Individuals, not classes, are held responsible for disorderly acts; indeed, public sentiment in college is strongly against the rowdyism common in some of the neighboring institutions. To this, and to the strict government of President Elliot, may be ascribed the suppression of hazing. The most virulent form of this is now seen in the annual "card-war." It is a common custom of students to post their cards on their study doors; Freshmen, however, are not expected to enjoy the advantages of door-plates, and their attempts in this direction are ruthlessly thwarted by the Sophomores. Last year, much to the disgust of the latter, the authorities protected Freshman doors, while the destruction of Sophomore cards was unnoticed. Under the new president, the annual rushes in the gymnasium on "Bloody Monday," and on the campus on Class Day, have been entirely suppressed by threats of suspension, or of delivery into the hands of the law.

Harvard, unlike Yale, and most large colleges, is peculiarly a local institution. Eighty per cent. of its students are from New England, and seventy per cent from Massachusetts. Probably half are Bostonians, and this may account for the spirit of caste which prevails.

The secret society is much less prominent here than in other colleges. Greek-letter societies were long since abolished, and their place is supplied by semi-secret local organizations, of a social and literary character. Many like the Institute of 1770, the Everett Athanæum, and the Hasty Pudding Club, are of very long standing, and bear on their records the names of many distinguished men. The Society of the Christian Brethren holds weekly prayer meetings, the only social religious service in college. Amusements are much the same as elsewhere. Theatre going is quite popular. Music is below par, Glee Club and Chapel choir are no better than they should be, and, but for the Freshmen, college songs would be extinct in this their American *Alma mater.* Base Ball is popular with a few, and all take a hearty pride in the University Nine. Boating has deservedly more votaries, as the spacious boat-house with its fifty practice boats would indicate, but the narrow, shallow, Charles River, meandering through the salt marshes, compares but poorly with our own Connecticut. The Gymnasium is poorly ventilated, and is not generally patronized. The instructor is a broad-shouldered, active mulatto, who also runs a second hand clothing store in an adjoining street. He feels the honor of his position. Some years ago much comment was excited, by the announcement of the marriage of Frederick Douglass, Jr., to the daughter of Prof. T. Molyneaux Hewlett, of Harvard University. The range of electives is very great, and so much freedom of choice is allowed, that after the first year the student may devote two thirds of his time to studies bearing directly upon his future profession. Of course this is abused, and men by selecting the easiest branches, make sure of reciting finely (or in Harvard parlance, of "squirting") every time, and thus gain an unfair rank. There are quite substantial motives for this, for the first few scholars in each class are entitled to scholarships of from seventy-five to three hundred dollars *per annum*. Examinations are very rigid, and play an important part in the determination of class rank.

Evening prayers, and Sophomore and Junior Exhibitions, are things of the past. Morning prayers come at 6.45 A.M. At the sound of the bell, in throng the students, their toilets mayhap not so sumptuous as would be deemed requisite for an evening party. Services are conducted by Dr. Peabody, the college preacher. During the reading of Scriptures the monitors rise in their seats and mark the absentees. Attendance is required only three times a week, each student attending on those mornings which best suit his convenience. Announcements of general interest are made by bulletin and not in chapel. Sabbath morning, if so inclined, students attend divine worship in the Appleton Chapel, a gloomy, cheerless room, whose architectural beauties, few enough in the beginning, are destroyed by the sounding boards and other appliances designed to remedy its acoustic defects. The officiating clergyman is Dr. A. P. Peabody, college preacher and Professor of Morals, long the successful editor of the *North American Review.* Awkward and labored in his delivery, his sermons abound in deep, earnest thought, simply and forcibly expressed. Their theology would pass muster with any Methodist congregation, though the preacher is theoretically a staunch Unitarian of the old school. Regular attendants upon this service are Prof. Longfellow, the Hon. John G. Palfrey, New England's historian, whose residence is close at hand, Prof. Wyman, the anatomist, and many of the Professors.

Prof. Asa Gray, the botanist, and some others cling to the old Harvard faith, the congregational.

The library is in Gore Hall, a Yankee Gothic granite structure, built in imitation of Kings College Chapel, Cambridge University. This is not nearly so commodious as our own Rich Hall, and is very inconveniently crammed with books, while four enormous stacks of steam pipes connected with the heating apparatus, add to the cramped appearance of the room. The annual increase of the library is small, and the management very conservative.

A noticeable feature is the presence of young lady assistants, who trip about the room apparently understanding and enjoying their business.

Take it for all in all, Harvard is our nearest approach to the grand old universities of Europe. Its liberal and far sighted policy render it certain that when America is ready for a true university, Cambridge will be its seat. [illegible]

[illegible]

APPENDIX.

All the names embraced in the tables I, II, III, and IV, following are found in one or more of the lists of "Colleges and Collegiate Institutions in the United States," compiled by John Eaton, Esq., commissioner of education, David N. Camp, Esq., editor of the American Year Book for 1869, and G. Brown Goode, Esq., editor of the Wesleyan University College Argus, with the exception of seven names in the first table and two names in the third, not contained in either of those lists. The design is, to obtain, if possible, such a classification as shall exhibit the number of regularly chartered colleges in the country; and also the educational institutions heretofore confounded with them, in groups by themselves. With regard to the colleges and high schools under charge of the clergy of the Roman Catholic church it has been impossible to make this distinction for want of information. Those of these institutions which have college charters are made up in great part of boys below the age and grade of college students. It has been thought best therefore to place them all in a single group.

A recount of the names in the lists above mentioned, made since the report was written, gives as the total number of different names, four hundred and sixty-nine; of which three hundred and six appear to be names of colleges; sixty-six Roman catholic schools; sixty-eight, colleges for females; and twenty-nine, institutes or high schools for males. The following tables contain respectively, the first, three hundred and thirteen names; the second, sixty-six; the third, sixty-eight; and the fourth, thirty-one.

Table I.

Colleges of the United States, incorporated and empowered by charter to confer degrees in Arts.

STATE.	NAME.	LOCATION.	DENOMINATION.	ORGANIZED.	PRESIDENT.
Alabama	University of Alabama	Tuscaloosa		1831	Hon. William R. Smith.
"	Howard College	Marion	Bapt.	1841	Not given.
"	East Alabama College	Auburn	M. E.	Not given	"
"	Southern University	Greensborough	M. E.	"	"
"	La Grange College	La Grange	Pres.	1830	"
"	Florence University	Florence	Pres.	Not given	"
Arkansas	St. John's College	Little Rock		1868	Colonel L. E. Barber.
California	University of California	Oakland		1855	John Le Conte, M. D. (acting).
"	Pacific Methodist College	Vacaville	M. E.	1851	Rev. J. R. Thomas, D. D., LL. D.
"	University College	San Francisco		1859	Rev. P. Veeder.
"	University of the Pacific	Santa Clara	M. E.	1851	T. H. Sinex, D. D.
"	St. Augustine College	Benicia		1868	Rev. William P. Tucker, A. M.
"	San Rafael College	San Rafael		1869	Alfred Bates
"	Sonoma College	Sonoma		1858	Rev. W. N. Cunningham.
"	College of California	Not given		Not given	Not given.
"	Petaluma College	Petaluma	Bapt.	1866	Mark Bailey, A. M.
Colorado	Colorado College	Golden City		Not given	Not given.
Connecticut	Yale College	New Haven	Cong	1801	Rev. T. D. Woolsey, D. D., LL. D.
"	Wesleyan University	Middletown		1831	Rev. J. Cummings, D. D., LL. D.
"	Trinity College	Hartford	P. E.	1823	Rev. A. Jackson, D. D., LL. D.
Delaware	Brandywine College	Brandywine		Not given	Not given.
"	Delaware Agricultural College	Newark		1833	Not given.
Georgia	Mercer University	Penfield	Bapt.	1838	Rev. H. Holcombe Tucker, D. D. (?)
"	Emory College	Oxford	M. E.	1837	Rev. Luther M. Smith, D. D.
"	University of Georgia	Athens		1801	Henry H. Tucker, D. D. (?)
"	Oglethorpe University	Milledgeville	Pres.	1835	A. A. Lipscomb, D. D.
"	Marshall College	Griffin	Bapt.	1854	J. M. Bonnell.
"	Cherokee College	Cassville	Bapt.	1855	Not given.
"	Atlanta University (Colored)	Atlanta		Not given	"

Georgia	Masonic College	Covington		Not given	Not given.
Illinois	Wheaton College	Wheaton	Cong	"	Rev. J. Blanchard.
"	Lombard University	Galesburg	Univ	1852	Rev. J. T. Weston, D. D.
"	Knox College	"	Cong	1838	Rev. John T. Gulliver, D. D.
"	Abingdon College	Abingdon		1853	J W. Butler, A. M.
"	Illinois Wesleyan University	Bloomington	M. E	1852	Rev. O. S. Munsell, D. D.
"	Eureka College	Eureka	Chr.	1852	N. W. Everest, A. M.
"	Illinois Soldiers' College	Fulton		1867	L. H. Potter
"	Northwestern University	Evanston	M. E	1855	Erastus O. Haven, D D., LL.D.
"	Monmouth College	Monmouth	U. P	1856	David A. Wallace, D. D.
"	Illinois College	Jacksonville	Bapt.	1830	Rev. J. M Sturtevant
"	Shurtleff College	Upper Alton		1832	Rev D. Read, LL. D.
"	McKendree College	Lebanon	M E	1828	Robert Allyn, D.D.
"	Jubilee College	Robin's Nest	P. E.	1847	Right Rev. H. P. Whitehouse.
"	Southern Illinois College	Carbondale.		1856	Not given.
"	Lincoln University	Lincoln	C. P	1865	Not given.
"	Chicago University	Chicago	Bapt.	1859	J. C. Burroughs, D. D.
"	Illinois Industrial University	Urbana		1868	Not given.
"	Quincy College	Quincy	M. E	1854	"
"	Marshall College	Henry		1855	"
"	Augustana College	Paxton	Luth	1860	"
"	Westfield College	Westfield		1861	"
"	Lake Forest College	Lake Forest		Not given	"
"	North Illinois College	Henry		"	"
"	North-West College	Plainfield		"	"
"	Howard College	Not given		"	"
"	Mendota College	Mendota	Luth	"	Rev. J. W. Corbet, A. W.
Indiana	Indiana University	Bloomington		1828	Rev. Cyrus Nutt, D. D.
"	Indiana Asbury University	Greencastle	M E	1837	Rev. Thomas Bowman, D. D.
"	Moore's Hill College	Moore's Hill	M. E	1856	Rev. Thomas Harrison, A. M.
"	Northwestern Christian Univ.	Indianapolis	Chr.	1855	O. A. Burgess, A.M.
"	Wabash College	Crawfordsville	Pres.	1834	Rev. Joseph F. Tuttle, D.D.
"	Union Christian College	Merom	Chr.	1859	Rev Thomas Holmes, D D.
"	Earlham College	Near Richmond	Fr.	1860	Joseph Moore, M.S.
"	Brookville College	Brookville	M. E.	Not given	J. H Martin, A.M.
"	Franklin College	Franklin	Bapt.	1843	Rev. W. Hill, A M.
"	Hartsville University	Hartsville	U. B	1850	J. W. Scribner, A.B.
"	Valparaiso College	Valparaiso		Not given	Rev. Thomas B Wood.
"	Hanover College	Hanover	Pres.	1833	G. D. Archibald, D.D.

TABLE I.—*Continued.*

STATE.	NAME.	LOCATION.	DENOMINATION.	ORGANIZED.	PRESIDENT.
Indiana	Pendue College	Indianapolis		Not given	Not given.
"	Fort Wayne College	Fort Wayne		"	"
"	De Pauw College	Not given	M. E.	"	"
"	Concordia College	Fort Wayne	Luth	"	"
Iowa	Simpson Centenary College	Indianola	M. E	1867	Rev. A. Burns, D.D.
"	Iowa State University	Iowa City		1860	James Black, D.D.
"	Norwegian Lutheran College	Decorah	Luth	1861	Not given.
"	Central University of Iowa	Pella	Bapt	1856	E. H Scarf.
"	Cornell College	Mount Vernon	M. E	1857	Rev. W. F. King, A M.
"	Iowa Wesleyan University	Mount Pleasant	M. E	1855	C. A. Holmes, D.D.
"	Burlington University	Burlington	Bapt	1854	James Henderson.
"	Griswold College	Davenport	P E	1859	Horatio N. Powers, D.D.
"	Whittier College	Salem	Fr.	1867	John H Pickering.
"	Iowa College	Grinnell	Cong	Not given	Rev. J. F. Magoun, A.M.
"	Upper Iowa University	Fayette	M. E	1858	Wm. Brush, A.M.
"	Iowa Lutheran College	Albion	Luth	1860	Not given.
"	Washington College	Not given		Not given	"
"	Tabor College	Tabor	Cong	"	"
"	Fairfield College	Fairfield	Luth	1858	William Brush, A. M.
Kansas	Washburn College	Topeka	Cong	1865	Not given.
"	Baker University	Baldwin City	M. E	1858	Rev. J. A. Simpson, A.M.
"	State University	Lawrence		1864	John Fraser.
"	Irving College	Irving		Not given	Not given.
"	State Agricultural College	Manhattan		"	"
"	Lincoln University	Topeka	Pres.	"	"
"	Ottawa College	Ottawa		"	"
"	Manhattan College	Not given		"	"
"	Lecompton College	"		"	"
"	Hope College	"		"	"
"	Highland University	Highland	Pres.	1858	Rev. John McAfee, A. M.
Kentucky	Kentucky University	Lexington		1859	John B. Bowman, A.M.
"	Bethel College	Russellville	Bapt	1854	Noah K. Davis, A. M.
"	Berea College	Berea		1858	Rev. E. H. Fairchild.

Kentucky	Georgetown College	Georgetown	Bapt	1838	N. M. Crawford, D. D.
“	Centre College	Danville	Pres	1823	Not given.
“	Kentucky College	Harrodsburg	Chr	1858	“
“	Shelby College	Shelbyville		Not given	“
“	Augusta College	Augusta	M. E.	“	“
“	Bacon College	Harrodsburg		1836	“
Louisiana	Centenary College	Jackson	M. E.	1845	W. H Watkins, D. D.
“	Louisiana State University	Baton Rouge		Not given	Colonel D. F. Boyd.
“	Mount Lebanon University	Mount Lebanon.	Bapt	1853	Not given.
“	Straight College	New Orleans		1869	“
“	Baton Rouge College	Baton Rouge		1838	“
“	Franklin College	Opelousas		1839	“
“	Leland University	New Orleans	Bapt	Not given	E. E. S. Taylor, D. D.
Maine	Bowdoin College	Brunswick	Cong	1802	Samuel Harris, D. D.
“	Colby University	Waterville	Bapt	1820	Rev. James T. Champion, D. D.
“	Bates College	Lewiston	F.W Bapt.	1864	Orrin B. Cheney.
“	State Agricultural College	Orono		1865	Not given.
Maryland	St. John's College	Annapolis	P. E.	1793	James C. Welling, LL.D.
“	Washington College	Chestertown		1783	R. C. Berkeley, M. A.
“	St. James's College	Washington Co.	P. E.	1842	Not given.
“	Rock Hill College	Ellicott City	Chr.	Not given	“
“	Maryland Agricultural College	Hyattsville		1856	Franklin Buchanan.
Massachusetts	Williams College	Williamstown	Cong	1793	Rev. Mark Hopkins, D. D., LL.D.
“	Tuft's College	Medford	Univ	1855	A. A. Miner, D. D.
“	Amherst College	Amherst	Cong	1821	William A. Stearns.
“	Harvard University	Cambridge	Unitar.	1638	Charles W. Eliot, LL. D.
“	Agricultural College	Worcester		1870	Not given.
Michigan	Olivet College	Olivet	Cong	1859	Rev. N. J. Morison, D. D.
“	University of Michigan.	Ann Arbor		1841	Henry S. Frieze, A. M.
“	Kalamazoo College	Kalamazoo	Bapt	1855	Rev. Kendall Brooks, D. D.
“	Albion College	Albion	M. E	1843	George B. Joselyn.
“	Hillsdale College	Hillsdale	Bapt	Not given	Not given.
“	Adrian College	Adrian	M. E.	1859	Asa Mahan, D. D.
“	Hope College	Holland		Not given	Not given.
“	Benzonia College	Not given		“	“
Minnesota	University of Minnesota	St. Anthony		“	Wm. M. Folwell, A. M.
“	Hamline University	Red Wing	M. E.	1856	Jabez Brooks, A. M., D. D.
“	Northfield College	Northfield	Cong	Not given	Not given.
Mississippi	Mississippi College	Clinton	Bapt	1851	Rev. Walter Hillman, A. M.

TABLE I.—*Continued.*

STATE.	NAME	LOCATION.	DENOMINATION.	ORGANIZED	PRESIDENT.
Mississippi	University of Mississippi	Oxford		1845	J. N. Waddell, D.D.
"	Madison College	Sharon		1850	W. L. C. Hinnicutt.
"	Oakland College	Oakland	Pres.	1830	W. L. Breckenridge, D. D.
"	Semple-Broaddus College	Centre Hill	Bapt	1857	William W. Hawkins, A. M.
"	Jefferson College	Washington		1813	Prof. Hamilton.
"	Alcorn University (Colored)	Jackson		1871	Daniel Read, LL D.
Missouri	University of Missouri	Columbia		1843	Hon. Henry R. Revels.
"	Washington University	St. Louis		1857	Not given.
"	William Jewell College	Liberty	Bapt	1848	Thomas Rambant, D. D.
"	Westminster College	Fulton	Pres.	1853	M. M. Fisher.
"	Jefferson City College	Jefferson City	P. E.	1867	W. H D. Hatton.
"	Lewis College	Glasgow	M. E.	1867	J. S. Barwick, A.M.
"	Mount Pleasant College	Mount Pleasant	Bapt	1855	Not given.
"	Christian College	Canton	Chr	Not given	"
"	Centre College	Not given	M. E.	"	"
"	Pardee College	Louisiana		"	"
"	College of Missouri	Kidder		"	"
"	Masonic College	New Palmyra		1831	"
"	St Charles College	St. Charles	M E.	1837	"
"	Lindenwood College	Near St. Charles.	Pres.	1858	French Strother.
"	Fayette College	Fayette		Not given	Not given.
Nebraska	Nebraska State College	Nebraska City		"	"
"	Congregational College	Fontenelle	Cong	"	"
New Hampshire	Dartmouth College	Hanover	Cong	1769	Rev. Asa D. Smith, D.D. LL.D.
New Jersey	College of New Jersey	Princeton	Pres.	1746	Rev. James McCosh, D.D., LL.D.
"	Rutgers College	New Brunswick	Ref	1770	Rev. W. H. Campbell, D D., LL.D.
"	Burlington College	Burlington	P. E.	1846	Rt. Rev. Wm. H. Odenheimer, D D.
New York	St. Lawrence University	Canton	Univ	1856	Rev. R. Fisk, Jr., A. M.
"	Alfred University	Alfred	Bapt	1836	Rev. Jonathan Allen.
"	Hamilton College	Clinton	Pres.	1812	Rev. S. Gilman Brown, D.D.
"	University of Rochester	Rochester	Bapt	1850	Martin B. Anderson, LL.D.
"	Cornell University	Ithaca		1865	Andrew D. White, LL D.
"	Union College	Schenectady	Pres.	1795	Rev. C. A. Aiken, Ph.D., D.D.

New York	Genesee College	Lima	M. E.	1849	Rev. D. Steele, D.D.
"	University of the City of N. Y	New York City.		1847	Rev. Howard Crosby, D. D.
"	Columbia College	"	P. E.	1754	F. A. P Barnard, S. T. D., LL D.
"	Hobart College	Geneva	P. E.	1825	Jame Rankine, D. D.
"	Madison University	Hamilton	Bapt	1846	Geo W. Eaton, D D, LL D.
"	St. Stephen's College	Annandale	P. E.	1860	R. B. Fairbairn, D.D.
"	College of the City of New York.	New York City		1866	Alex. S. Webb, LL. D.
"	Martin Luther College	Buffalo	Luth	1853	Not given.
"	Syracuse College	Syracuse	M. E.	1870	Not given.
North Carolina	Wake Forest College	Raleigh	Bapt	1839	Rev. W. M. Wingate, D D.
"	Davidson College	D. Coll. (P. O.)	Pres.	1831	Rev. G. W. McPhail, D.D., LL.D.
"	University of North Carolina	Chapel Hill		1795	Rev. Solomon Pool.
"	Trinity College	Randolph Co.	M. E.	1850	Rev. B. Craven, D.D.
"	Olin College	Iredell Co.		1853	James Southgate.
"	North Carolina College	Mount Pleasant		Not given	S. A Bickle, A.M.
Ohio	Marietta College	Marietta	Cong	1835	Israel W. Andrews, D.D.
"	Western Reserve College	Hudson	Pres.	1826	Rev H. L. Hitchcock, D.D.
"	Denison University	Granville	Bapt	1831	Rev. S. Talbot, D.D.
"	Kenyon College	Gambier	P. E.	Not given	Eli T. Tappan, A M.
"	Wittenberg College	Springfield	Luth	1845	Rev. S Sprecher, D.D.
"	Willoughby College	Willoughby	M. E.	Not given	Rev James H Herson, A. M.
"	Harlem Springs College	Harlem Springs		1867	Robert H. Hovey, B.S.
"	Ohio Wesleyan University	Delaware	M. E.	1843	Rev. F. Merrick.
"	Muskingum College	New Concord		1837	Rev. David Paul, A. M.
"	Miami University	Oxford		1809	Robert L. Stanton, D.D.
"	Oberlin College	Oberlin	Cong	1834	Rev. James H. Fairchild.
"	Ohio University	Athens		1804	S. Howard, D.D., LL D.
"	Otterbein University	Westerville	U. B.	1857	Rev. L. Davis.
"	Urbana University	Urbana	N. Ch.	1852	Rev. Chauncey Giles.
"	Antioch College	Yellow Spring	Un.&Chr.	1854	Geo. W. Hosmer, D D.
"	Wilberforce University (Col'red)	Near Xenia.	A. M. E.	1863	D. A. Payne, D.D.
"	German Wallace College	Berea	M. E.	1864	William Mast, D D.
"	Xenia College	Xenia	M. E.	1850	Wm. Smith, A M.
"	Mount Union College	Mount Union	M. E.	1858	O. N. Hartshorn, LL.D.
"	Farmers' College	College Hill	M. E.	1846	Chas D. Curtiss.
"	Heidelberg College	Tiffin	C. R.	1850	G. W. Willard, D.D.
"	Richmond College	Richmond		1835	L. W. Ong, A.B.
"	Baldwin University	Berea	M. E.	1846	John Wheeler, D.D.
"	Wooster College	Wooster		Not given	Not given.

TABLE I.—*Continued.*

STATE.	NAME.	LOCATION.	DENOMINATION.	ORGANIZED.	PRESIDENT.
Ohio	Alliance College	Alliance	Camp'lite	"	Not given.
"	Franklin College	New Athens		1825	Not given.
"	Cincinnati Wesleyan College	Cincinnati	M. E.	Not given	L. H. Bugbee, D. D.
"	Capitol University	Columbus	Luth	"	Rev. W. N. Lehman
Oregon	Pacific University	Forest Grove		"	Rev. S. H Marsh, D.D.
"	Sublimity College	Sublimity	U. B.	1858	J. H. Garrison.
"	Oregon College	Oregon City	Bapt,	1850	Geo. C Chandler, D.D.
"	Willamette University	Salem	M. E.	1853	L T Woodward, A.M.
Pennsylvania	Haverford College	West Haverford	Fr.	1833	Samuel Gummere, A.M.
"	Lehigh University	South Bethelem	P. E.	1866	Henry Coppee, LL D.
"	Baptist University	Lewisburg	Bapt	1847	Rev. J. R. Loomis, LL.D.
"	Muhlenberg College	Allentown	Luth	1867	Rev F. A. Muhlenberg, D.D.
"	Pennsylvania College	Gettysburg	Luth	1832	Milton Valentine, D.D.
"	Westminster College	New Wilmington.	U. P.	1852	Rev. R. A Browne, D.D.
"	Alleghany College	Meadville	M. E.	1815	Rev. Geo. Loomis, D.D.
"	Western University	Pittsburg		1819	George Woods, LL.D.
"	Franklin and Marshall College	Lancaster	G. R.	1853	Rev. J. W Nevin, D.D.
"	Moravian College	Bethlehem	Morav.	1807	Rev. E de Schweinitz.
"	Dickinson College	Carlisle	M. E.	1783	Not given.
"	Washington & Jefferson College	Canonsb. & Wash'n	Pres.	1802	Jonathan Edwards, D.D.
"	Lincoln University	Oxford	Pres.	1854	Rev. J. N. Randall, D D.
"	Waynesburg College	Waynesburg	C. P.	1850	A. B. Miller
"	Andalusia College	Andalusia	P. E.	1860	Rev. H. T. Wells, LL D.
"	Lebanon Valley College	Annville	U. B.	1866	Rev. T. R. Vickroy, A.M.
"	Lafayette College	Easton	Pres.	1832	Not given.
"	University of Pennsylvania	Philadelphia		1755	D R. Goodwin, D.D.
"	Agricultural College	Not given		Not given	Not given.
"	Swarthmore College	"	Fr	1869	"
"	Mercersburg College	Mercersburg	G. R.	Not given	Thomas G. Apple, D. D.
"	Palatinate College	Myerstown	G. R.	"	Rev. H. R. Hick, A. M.
"	Cottage Hill College	York		"	Rev. D. Eberle.
"	Maimonides College	Philadelphia		"	Not given.
Rhode Island	Brown University	Providence	Bapt.	1764	Rev. A. Caswell, D D., LL D.

South Carolina	Newberry College	Walhalla	Luth.	1859	Rev. J. P. Smeltzer, A.M.
"	University of South Carolina	Columbia		1801	R W. Barnwell, LL.D.
"	Furman University	Greenville	Bapt.	1851	Jas. C. Furman, D.D.
"	College of Charleston	Charleston		1787	N. R. Middleton.
"	Wofford College	Not given	M. E.	Not given	Not given.
"	Claflin College (Colored)	"	M. E.	Not given	"
Tennessee	Maryville College	Maryville	Pres.	1819	Rev. P. M. Bartlett, A.M.
"	Cumberland University	Lebanon	C. P.	1842	B. W. McDonald, D.D , LL.D.
"	East Tennessee University	Knoxville		1807	Rev. T. W. Humes, D.D.
"	Franklin College	Near Nashville	Ch	1844	A. J. Fanning.
"	Jackson College	Columbia		1833	Not given.
"	University of Nashville	Nashville	Pres.	1806	"
"	Tusculum College	Greenville	Pres.	1844	Rev. W. S. Doak, A.M.
"	Union University	Murfreesboro	Bapt.	1848	Rev. D. H. Selph, A.M.
"	Sewanee College	Winchester	P. E.	1868	Rev. H. H. Sneed.
"	East Tennessee Wesleyan Univ	Athens	M. E	1867	N. E. Cobleigh, D.D.
"	Central Tennessee College	Nashville	M. E.	1866	John Braden.
"	Fisk University (Colored)	Nashville	M. E	1867	John Ogden, A.M.
"	West Tennessee University	Jackson		Not given	Not given.
"	Stewart College	Not given		"	"
"	Soule College	Not given	M. E.	"	"
"	Andrew College	Not given	M. E.	"	"
"	Presbyterian Synodical College	Lagrange	Pres.	1856	"
"	Hiawassa College	Madisonville	Luth.	Not given	J. B. Greiner, A. M.
"	Granville College	Granville		1796	Wm. B. Rankin.
"	Kings College	Bristol		Not given	Charles Martin.
Texas	Colorado College	Columbus	Luth.	1857	Rev J. J. Sheever.
"	Baylor University	Independence	Bapt	1845	W. Carey Crane, D D.
"	Waco University	Waco	Bapt.	1861	Rufus C Burleson, D.D.
"	Masonic College	Belton		Not given	Not given.
"	Rutersville College	Opelousas		"	"
"	Galveston College	Galveston		"	"
"	Aranama College	Goliad		1852	J. E C. Doremus, D. D.
Vermont	Middlebury College	Middlebury	Cong.	1797	H. D. Kitchel
"	State University	Burlington		Not given	James B. Angell, A.M.
"	Norwich University	Northfield		1834	Roger S. Howard.
Utah	University of Deseret	Salt Lake	L. D. S.	Not given	Not given.
Virginia	Richmond College	Richmond	Bapt.	1844	B. Puryear, A.M.
"	Randolph Macon College	Boydton	M. E.	1832	J. C. Johnson, A.M.

TABLE I.—*Continued.*

STATE.	NAME.	LOCATION.	DENOMINATION.	ORGANIZED.	PRESIDENT.
Virginia	Roanoke College	Salem	Luth.	1853	Rev. D. F. Bittle.
"	Emory and Henry College	Washington	M. E.	1838	E. E. Wiley, D.D.
"	Hampden Sidney College	Prince Edw'd Co.	Pres.	1776	J M. P. Atkinson, D.D.
"	Washington & Lee University	Lexington		1782	Gen G. W. Custis Lee.
"	University of Virginia	Charlottesville		1825	S. Maupin, A M.
"	College of William & Mary	Williamsburg		1693	Benjamin S. Ewell.
"	State College	Not given		Not given	—— Martin.
"	Alleghany College	Blue Sulphur	Bapt.	1854	Not given.
"	Stover College	Harper's Ferry	F.W.Bapt	Not given	Not given.
"	Rector College	Prunytown	Bapt.	1839	Not given.
"	Wytheville College	Wytheville	Luth.	Not given	Rev. E W. McDonald.
Washington	Washington University	Seattle		1868	Prof. Hall.
West Virginia	West Virginia University	Monongalia		1868	Rev. A. Martin, D.D.
"	Bethany College	Bethany	Chr.	1841	W. K Pendleton.
"	Marshall College	Long Lane		Not given	Not given.
Wisconsin	University of Wisconsin	Madison		1848	P. A. Chadbourne, M.D., LL.D.
"	Galesville University	Galesville	M. E.	1839	Harrison Gilliland.
"	Wayland University	Beaver Dam	Bapt.	1854	A S. Hutchens.
"	Beloit College	Beloit	Cong.	1847	Aaron L. Chapin, D.D.
"	Carroll College	Waukesha	Pres.	1846	W. L. Rankin, A M.
"	Lawrence University	Appleton	M. E.	1847	George M. Steele, D D.
"	Milton College	Milton	Bapt.	1844	Rev. W. C. Whitford, A M.
"	Northwestern University	Watertown		1864	Rev L. O Thompson.
"	Prairie du Chien College	Prairie du Chien		1865	W. S Perry.
"	Racine College	Racine	P. E.	1852	Rev. J. DeKoven, D D.
"	Ripon College	Ripon		1863	Rev. W. E. Merriman, A M.
"	Janesville College	Janesville		Not given	Not given.
Dist. of Columbia	Columbian College	Washington	Bapt.	1822	Rev. Geo W. Samson, D D.
"	Howard University (Colored)	"		1867	Gen. O. O. Howard.

Table II.

Colleges and High Schools in the United States, directed by the Fathers of the Roman Catholic Church.

STATE.	NAME.	DATE OF ORGANIZATION.	ATTENDANCE.	LOCATION.	PRESIDENT.
Alabama	Spring Hill College	1830	...	Near Mobile	Rev. L. Curioz. (?)
Arkansas	St. Andrew's "	Not given.	...	Fort Smith	Not given.
California	St. Mary's "	1863	...	San Francisco	Brother Justin.
"	St. Vincent's "	1867	..	Los Angeles	Rev. Jas. McGill.
"	St. Ignatius' "	1858	569	San Francisco	Rev. N. Congiato.
"	Santa Clara "	1851	218	Santa Clara	Rev. A. Varsi.
"	Franciscan "	1868	...	Santa Barbara	Rev. J. J. O'Keefe, O S F.
"	Coll. of our L. of Guadaloupe	Not given.	...	" "	Bro Pascal Doran, O. S. F.
Delaware	St. Mary's College	1847	...	Wilmington	Not given.
District of Columbia	Georgetown "	1792	206	Georgetown	Rev B. A. Maguire.
"	Gonzaga "	1848	186	Washington	Rev. B. F. Wiget.
Illinois	St. Patrick's "	Not given.	...	Ruma	Not given.
"	St. Ignacius' "	"	...	Chicago	"
"	St. Viateura "	"	...	Bourbonais	"
"	St. Aloysius' "	1868	...	East St. Louis	F. H. Zabel, D. D. D. C. L.
Indiana	University of Notre Dame	1844	439	Notre Dame	Rev. W. Corby, S. S. C.
"	St. Meinrad College	1860	...	St. Meinrad	Rev. J. Hobie, O. S. B.
Kansas	St. Benedict's "	Not given.	..	Atchison	Not given.
"	Topeka "	"	...	Topeka	"
Kentucky	St Joseph's "	1819	...	Bardstown	"
"	St. Mary's "	1826	...	Marion County	Rev. A. Viala,
"	Cecil "	Not given.	...	Elizabethtown	H. A. Cecil.
Louisiana	Jefferson "	"	..	St. Michael	Not given.
"	St. Charles "	1852	...	Grand Coteau	Rev. L. Curioz. (?)
"	Coll. of the Immaculate Conception	Not given.	...	New Orleans	Rev. A. Jourdan.

TABLE II.—*Continued.*

STATE.	NAME.	DATE OF ORGANIZATION.	ATTENDANCE.	LOCATION.	PRESIDENT.
Louisiana	St. Joseph's Day School	1856	...	Natchitoches	Rev. F. Lee Vezonët.
Massachusetts	Boston College	1863	..	Boston	Rev. Robt. W. Brady.
"	College of the Holy Cross	1843	141	Worcester	Rev. A. F. Campi.
Maryland	Calvert College	Not given.	...	New Windsor	Not given.
"	St. Charles "	1848	...	Howard County	Rev. O. L. Jenkins.
"	Mt. St. Mary's College	1850	...	Near Emmetsburg	Not given.
"	Borromeo "	1860	...	Pikesville	Rev. E. Q. S. Waldron.
"	Loyola "	1852	108	Baltimore	Rev. John Early.
"	Mt. St. Clement's College	1868	...	Ilchester	Rev. S. Vaude Bruak, C. S, S. R.
"	Rock Hill College	1857	...	Ellicott City	Brother Bettelin.
Michigan	St. Philip's "	Not given.	...	Detroit	Not given.
Minnesota	St. John's "	"	...	Clinton	"
Missouri	O'Fallon "	"	...	Not given	"
"	St. Louis University	1832	297	St. Louis	Rev. F. H. Stuntebeck.
"	St. Vincent's College	1843	...	Cape Girardeau	Rev. J. Alizeri.
"	St. Joseph's "	1867	...	St. Joseph	Brother Agatho.
"	College of the Christian Brothers	1857	...	St. Louis	Brother Edward.
New Jersey	Seton Hall	Not given.	...	South Orange	Not given.
New Mexico	San Miguel College	"	...	Santa Fé	"
New York	Franciscan "	"	...	Alleghany	"
"	Seminary of our Lady of Angels	"	...	Suspension Bridge	"
"	St Joseph's College	1861	232	Buffalo	Brother Francis.
"	College of St. Francis Xavier	1847	506	New York City.	Rev. J. Loysanze.
"	St. John's College	1846	257	Fordham	Rev Joseph Shea.
"	Manhattan " 1866–7	1863	709	New York City.	Brother Patrick.
"	St. Joseph's "	Not given.	...	Rhinecliff	Rev. M. J. Scully.
"	St. John Baptist's College	"	...	Brooklyn	Rev. J. Landry, C. M.
Ohio	Mt. St. Mary's of the West	1851	...	Near Cincinnati	F. J. Pabish, D.D., LL.D.
"	St. Xavier College	1842	320	Cincinnati	Rev. Thomas O'Neil.
"	St. Louis "	1866	..	Louisville	F. Hours.
Oregon	Holy Angels "	Not given.	...	Vancouver	Not given.
Pennsylvania	La Salle "	"	...	Philadelphia	"

Pennsylvania	Augustinian College	Not given	...	Haverford	Not given.
"	St. Joseph's "	1862	...	Philadelphia	P. A. Jordan.
"	St. Vincent's "	1846	212	Westmoreland County	Rev. A. Helmer.
"	St. Francis "	1850	...	Loretto	Rev. A. J. Browman.
"	St. Thomas of Villanova's Coll	Not given.	...	Not given	Not given.
Texas	St. Mary's College	"	...	San Antonio	"
"	St. Mary's "	"	...	Galveston	"
"	St. Joseph's "	"	...	Galveston	"
Wisconsin	Salesianum Seminary	1856	...	St. Francis	Jos. Salzmann, D.D.

N. B.—The attendance, where given, is for 1870, except in one instance, which is indicated in the table.

TABLE III.

Colleges and High Schools, in the United States, for Females only.

STATE.	NAME.	LOCATION.	DENOMINATION.	DATE OF ORGANIZATION.	PRESIDENT.
California	Female College of the Pacific	Oakland		1864	Rev. E B. Walsworth.
Georgia	Wesleyan Female College	Macon	M. E.	1838	R. C. Smith.
"	Cuthbert "	Cuthbert	Not given	Not given.	Dr. A. H. Hamilton.
"	Southern "	Lagrange	"	"	Dr. Cox.
"	Hamilton "	Hamilton	"	"	Col. Loveless.
"	Lagrange "	Lagrange	"	"	Rev. M. Calloway.
"	Griffin "	Griffin	"	"	Not given.
"	Forsyth "	Forsyth	"	"	"
"	Perry "	Perry	"	"	"
"	Masonic "	Americus	"	"	"
"	Madison "	Madison	"	"	"
"	Marietta "	Marietta	"	"	"
"	Atlanta "	Atlanta	"	"	"
"	Masonic "	Lumpkin	"	"	"
"	Le Vert "	Talbotton	"	"	"
Illinois	Illinois "	Jacksonville	M E.	1850	W. H. De Motte, A.M.
"	Northwestern "	Evanston	M.E.	1855	Rev. L. H. Bugbee, A.M.
"	Southern Illinois "	Salem	M E.	1855	J. S. Moore, A. M.
"	Almira "	Greenville	Bapt.	1857	Not given.
"	Illinois Conference Female Col.	Jacksonville	M.E.	1850	Charles Adams, D.D.
"	Ewing Hall	Knoxville		Not given.	Not given.
Kentucky	The Daughters' College	Greenville Springs		1856	J. A. Williams, A.M.
"	Hocker Female College	Lexington		Not given.	J. H. Hocker, A.M.
Maryland	Baltimore "	Baltimore	M E.	1849	N. C. Brooks, LL.D.
Michigan	Michigan "	Lansing		1859	A. C. Rogers.
Mississippi	Sharon "	Sharon		1837	Rev. W. C. C. Hunnicutt.
"	Pass Christian "	Pass Christian	P.E	Not given.	Not given.
New Jersey	Bordentown College	Bordentown	Pres	1853	Rev. J H. Brakeley, A M.
New York	Vassar College	Poughkeepsie		1611	J. H. Raymond, LL.D.

New York	Elmira Female College	Elmira	Pres	1855	Rev A. W. Cowles, D.D.
“	Rutgers “	New York City	Pres	1838	H. M Pierce, LL.D.
“	Female Collegiate Institute	Fort Plain		1853	Rev. B. I Diefendorf, A.M.
“	Ingham University	Le Roy	Pres	1857	Rev. S D. Burchard, D D.
“	Packer Collegiate Institute	Brooklyn		Not given.	A. Crittenden, A M.
“	Wells College	Aurora		“	Not given.
North Carolina	Concord Female College	Statesville,		1854	Rev. E F. Rockwell, A.M.
“	Davenport “	Lenoir		1856	Rev. S. Lander, A M.
“	Chowan Collegiate Institute	Murfreesboro	Bapt	Not given.	A McDowell, D.D.
“	Murfreesboro Female College	“	M.E	“	Rev. Mr. Blackwell.
“	St. Mary's “	Raleigh	P E	“	A Smedes, D.D.
“	St. John's “	Oxford.	M E	“	Rev. C. B. Biddick.
“	Rutherford Seminary	Happy Home	Not given	“	Not given.
“	Raleigh Baptist College	Raleigh	Bapt	1870	W. Royall, D. D.
Ohio	Oxford Female College	Oxford	Pres	1854	Rev. R D. Morris.
“	Ohio “	College Hill		1851	Rev N. C. Burt, D D.
“	Hillsborough “	Hillsborough	M.E	1855	Rev. D. Copeland, A.M.
“	Glendale “	Glendale		1854	Rev. L. D. Potter, A M.
“	Granville “	Granville	Pres	1833	W. P. Kerr, A.M.
“	Springfield “	Springfield	M.E	1845	Rev. Jas. H. Herron, A.M.
“	Ohio Wesleyan Female College.	Delaware	M.E	1853	Park. S. Donelson, D.D.
“	Western Female Seminary	Oxford	Pres	1853	Helen Peabody.
“	Cleveland Female College	Cleveland	Not given	1854	S N. Sanford, A.M.
Pennsylvania	Irving “	Irvington	M.E	1856	Rev. T B. Ege, A M.
“	Baptist Female Institute	Lewisburg	Bapt	1847	Rev. J. R. Loomis, LL D.
“	Susquehanna Female College	Selin's Grove	Luth.	1859	S. Domer, A.M.
“	Pittsburg “	Pittsburg	M.E	1855	I. C. Pershing, D D.
“	Wilson College	Chambersburg	Cong	Not given.	Rev. T. Edwards, D D.
“	Allentown Female Collge	Allentown	G.R	“	Rev. Wm. R. Hofford, A M.
South Carolina	Spartanburg Female College	Spartanburg		“	Not given.
Tennessee	State “	Memphis	M.E	1858	Rev Dr. C. Collins.
“	Jonesboro “	Jonesboro	M.E	1865	Henderson Presnell, A.M.
“	Mary Sharp College	Winchester	Bapt	1867	C. Graves, LL.D.
“	Washington Female College	Washington County.	Pres	1796	Rev. W.B. Rankin.
“	Marysville College	Marysville	Not given	Not given.	Not given.
Virginia	Southern Female College	Petersburg	“	“	W. T. Davis, D.M.
Vermont	Ripley “	Poultney	M.E	1863	J. Newman, M.D.
Wisconsin	Milwaukee “	Milwaukee	Not given	1848	Miss Mary Mortimer.
“	Wisconsin “	Fox Lake	Cong	1862	Miss Mary L Crowell.

TABLE IV.

Institutions for Higher Education of Male Students in the United States, not chartered as Colleges.

STATE.	NAME.	ORGANIZED.	LOCATION.	PRESIDENT.
Alabama	Emerson Institute	Not given	Mobile	Not given.
California	Union College	1862	San Francisco	Dr. R. T. Huddert.
Georgia	Bowdon Collegiate Institute	1856	Bowdon	J. M. Richardson, B S.
Indiana	Stockwell Collegiate Institute	1861	Stockwell	John P. Rous, A.M.
"	Centreville Collegiate Institute	1865	Centreville	Rev. S. S. Potter.
"	Rockport Collegiate Institute	Not given	Rockport	Not given.
Illinois	Normal Institute	Not given	Normal	Not given.
Kansas	Hartford Collegiate Institute	1860	Hartford	A. D Chambers, A.M.
"	Westmore Institute	1863	Irving	Chas. E. Tibbetts.
"	Geneva Presbyterian Academy	1866	Geneva	Rev. S M. Irvin, A.M.
Kentucky	Kentucky Military Institute	1846	Near Frankfort	Col. R. T. P. Allen.
Louisiana	Franklin Collegiate Institute	1858	Washington Parish	Prof. W. H. Dixon.
Maine	Me. Wesleyan Seminary	1823	Kent's Hill, Readfield	H. P. Torsey, LL D.
Massachusetts	Mass. Inst. of Technology	1861	Boston	John D. Runkle, Ph. D.
Mississippi	Columbus Institute	1846	Columbus	Rev John F. Tarrant, A.M.
Missouri	Military & Collegiate Institute	1866	Lexington	G K. Smith.
"	Lincoln Institute	1871	Jefferson City	Not given.
New Jersey	Glenwood Collegiate Institute	1855	Matawan	A. B. Dayton, M.D.
New York	De Veaux College	1857	Suspension Bridge	Rev. G. H. Patterson, A.M.
"	Brooklyn College	1854	Brooklyn	D. H. Cochrane, Th.D.
"	Rensselaer Polytech. Institute	1824	Troy	Hon. James Forsyth.
North Carolina	Biddle Institute	Not given	Charlotte	Not given.
Pennsylvania	Girard College	1848	Philadelphia	W. H. Allen.
"	Missionary Institute	1858	Selin's Grove	Rev. P. Born.
"	Pennsylvania Military Acad	1861	Chester	Col. Theodore Hyatt.
"	Polytechnic College	Not given	Philadelphia	Not given.
South Carolina	Avery Institute	Not given	Charleston	Not given.
Tennessee	Lookout Mountain Institute	1866	Lookout Mountain	Rev. C. F. P. Bancroft.
Vermont	New Hampton Institute	1825	Fairfax	Rev. S M. Whiting, A.M.
Virginia	Virginia Military Institute	1839	Lexington	F. H. Smith, A.M.
Wisconsin	Jefferson Liberal Institute	1866	Jefferson	Elmore Chase, A.M.

TABLE V.

Undergraduates in attendance in one hundred and fifty-three colleges of the United States, mainly in the year 1869–70, *showing the number present in each from the New England states, and from New York, New Jersey and Pennsylvania. Where the attendance is given for other years the dates are designated.*

Universities and Colleges of the United States.	State.	Maine.	New Hamp.	Vermont.	Mass.	R. I.	Conn.	New York.	N. J.	Penn.	Other States.	Students of Arts.	Total of all descriptions.
Bowdoin College	Maine	118	2	..	5	..	..	1	..	..	6	132	237
Colby University	"	43	..	..	1	..	..	..	..	..	1	45	52
Bates College	"	60	10	..	3	1	..	..	..	..	2	76	77
Dartmouth College	"	9	119	70	30	1	3	16	..	3	38	289	418
Middlebury College	N. H.	..	1	38	..	..	1	11	..	..	3	54	54
Univ. of Vermont	Ver.	..	..	40	1	..	..	3	..	..	1	45	122
Norwich University	"	..	2	22	7	1	..	3	1	..	..	36	36
Harvard University	"	16	16	4	372	6	2	51	2	19	75	563	1107
Williams College	Mass.	..	..	5	43	..	4	63	13	3	28	159	159
Amherst College	"	12	6	10	118	2	19	37	3	9	39	255	255
Tufts College	"	6	..	6	34	1	..	3	..	..	..	50	63
Brown University	R. I.	4	5	3	33	81	8	6	2	6	11	159	197
Yale College	Conn.	8	4	2	42	2	146	129	20	42	123	518	736
Trinity College	"	2	..	..	4	3	25	15	2	6	26	83	93
Wesleyan University	"	8	6	6	32	2	19	41	14	6	19	153	153
Columbia College	N. Y.	..	..	..	..	..	..	114	15	..	..	129	772
Union College	"	1	..	1	..	..	1	77	1	1	5	87	114
Hamilton College	"	..	..	..	..	..	..	138	..	3	19	160	164
Madison University	"	1	..	7	3	1	..	59	11	2	16	100	162
Hobart College	"	..	..	..	..	..	1	40	..	3	10	54	80
Genesee College	"	..	..	..	..	..	..	30	..	1	1	32	66
University of N. Y. City	"	1	..	..	1	1	1	26	13	..	2	45	436
Rochester University	"	..	..	1	4	..	1	83	4	3	11	107	115
College of N. Y. City	"	..	..	..	..	..	..	169	1	..	..	170	768
St. Stephen's College	"	1	..	..	..	..	2	49	3	5	9	69	69
Cornell University	"	..	..	..	..	1	1	29	..	5	10	46	563
Alfred University, 1868–9	"	..	..	..	..	3	..	23	1	1	7	35	363
St Lawrence Univ., 1870–71	"	..	..	..	..	..	..	11	..	..	..	11	85
Princeton College	N. J.	..	1	..	..	..	2	38	104	82	97	324	328
Rutgers College	"	..	..	..	..	..	..	40	61	2	2	105	151
Univ. of Pennsylvania, 1870–1	Penn	..	..	..	..	..	..	..	..	..	..	..	759
Lafayette College	"	..	..	..	..	..	..	..	..	..	..	..	180
Dickinson College	"	..	..	..	..	..	..	1	5	45	33	84	94
Franklin and Marshall, 1870–1	"	..	..	..	..	..	..	..	..	71	4	75	134
Western University of Penn.	"	..	..	..	..	..	..	..	..	32	..	32	222
Westminster College	"	..	..	..	..	..	..	2	..	83	22	107	183
Lehigh University	"	..	..	..	..	..	..	..	..	..	..	..	75
Univ. at Lewisburgh, 1870–71	"	..	..	..	..	..	..	..	7	53	1	61	121
Haverford College, 1868–69	"	..	..	..	..	..	..	2	3	34	12	51	51
Alleghany College	"	..	..	..	1	..	..	4	..	63	23	91	141
Muhlenberg College	"	..	..	..	..	..	..	..	..	54	3	57	169
Waynesburg College	"	..	..	..	..	..	..	..	..	..	..	..	243
Luth. Mis. Institute	"	..	..	..	..	..	..	1	..	123	14	138	150
Lebanon Valley College	"	..	..	..	..	..	..	..	..	11	..	11	151
Pennsylvania College	"	..	..	..	..	..	..	1	..	73	19	93	161
St. John's College	Md.	..	..	..	..	..	..	..	..	..	87	87	181
Washington College, 1868–69	"	..	..	..	..	..	..	..	..	..	43	43	43

TABLE V.—*Continued.*

Universities and Colleges of the United States.	State.	Maine.	New Hamp.	Vermont.	Mass.	R. I.	Conn.	New York.	N. J.	Penn.	Other States.	Students of Arts.	Total of all descriptions.
Columbian College	D. C.	..	..	..	..	..	..	..	..	1	42	43	4 0
Howard University	"	..	..	..	..	..	1	..	..	..	4	5	414
University of Virginia	Va.	..	..	..	..	..	..	..	..	..	191	191	465
Washington College	"	..	..	..	1	..	..	5	1	2	332	341	341
Hampton-Sidney College	"	..	..	..	..	..	..	..	..	..	76	76	89
Roanoke College, 1868–69	"	..	..	..	..	..	..	..	..	..	61	61	185
Emory and Henry College	"	..	..	..	..	..	..	..	..	..	69	69	165
Richmond College	"	..	..	..	..	..	..	..	..	..	..	..	160
Randolph Macon College	"	..	..	..	..	..	..	..	..	..	..	.	109
Bethany College	W. Va.	..	..	..	..	..	1	..	..	10	59	70	91
Davidson College	N. C.	..	..	..	..	..	..	..	..	..	113	113	125
Wake Forest College	"	..	..	..	..	..	..	..	..	..	22	22	116
University of N. Carolina	"	..	..	..	..	..	..	..	..	..	..	..	55
University of S. Carolina	S. C.	..	..	..	..	..	..	..	..	..	..	..	42
Newberry College	"	..	..	..	.	..	..	..	..	..	18	18	80
University of Georgia	Ga.	..	..	..	..	..	..	..	..	..	162	162	344
Emory College	"	..	..	..	..	..	..	..	..	..	110	110	213
Oglethorpe University, 1870-1	"	..	..	..	..	..	..	..	..	..	..	..	150
Atlanta University	"	..	..	..	..	..	..	..	..	..	..	..	89
Mercer University	"	..	..	..	..	..	..	..	..	..	77	77	82
University of Mississippi	Miss.	..	..	..	..	..	..	..	..	..	124	124	208
Mississippi College	"	..	..	..	..	..	..	..	..	..	20	20	101
Baylor University	Texas	..	..	..	..	..	..	..	..	..	..	..	111
Maryville College	Tenn.	..	..	..	..	..	..	..	..	..	9	9	160
Cumberland University	"	..	..	..	..	..	..	..	..	..	57	57	401
E. Tennessee University	"	..	..	..	..	..	..	1	..	..	34	35	183
E. Tennessee Wesleyan Univ.	"	..	..	..	..	..	..	..	..	..	41	41	157
Central Tennessee College	"	..	..	..	..	..	..	..	..	..	..	..	192
Lookout Mountain Ed. Inst.	"	..	..	..	..	..	..	..	..	..	2	2	111
Kentucky University	Ken.	..	..	..	..	..	..	..	..	..	192	192	772
Bethel College	"	..	..	..	..	..	..	..	..	..	52	52	120
Georgetown College	"	..	..	..	..	..	..	..	..	..	..	..	73
Centre College	"	..	..	..	..	..	..	..	..	..	44	44	120
Western Reserve College	Ohio	..	..	..	..	..	..	1	..	5	72	78	115
Oberlin College	"	..	2	4	..	..	..	12	1	4	112	135	1111
Kenyon College	"	..	..	..	..	..	..	3	..	1	66	70	70
Marietta College	"	..	1	1	..	..	2	..	..	..	53	57	119
Denison University	"	..	..	..	..	..	1	..	..	1	47	49	175
Antioch College	"	1	..	..	2	..	1	1	..	1	12	18	244
Ohio Wesleyan University	"	..	..	..	..	..	..	1	..	..	189	190	417
Wilberforce University	"	..	..	..	..	..	..	..	..	..	1	1	100
Harlem Springs College	"	..	..	..	..	..	..	..	..	..	4	4	74
Heidelberg College	"	..	..	..	..	..	..	..	..	2	33	35	178
German Wallace College	"	..	..	..	..	..	..	..	..	..	..	..	93
Miami University	"	..	..	..	..	..	..	..	..	..	76	76	152
Baldwin University	"	..	..	..	..	..	..	..	..	..	11	11	227
Wittenberg College	"	..	..	..	..	..	..	1	..	4	69	74	183
Otterbein University, 1868–69	"	..	..	..	..	..	..	..	..	2	15	17	360
Wabash College	Ind.	..	1	..	..	..	..	..	3	..	60	64	209
Franklin College	"	..	..	..	..	..	..	..	..	..	11	11	209
Indiana University	"	..	..	..	..	..	..	..	..	..	66	166	279
Union Christian College	"	..	..	..	..	..	..	..	..	..	2	2	139
Ind. Asbury Univ., 1868–69	"	..	..	..	..	..	..	..	..	..	169	169	321
Hartsville University	"	..	..	..	..	..	..	..	..	..	4	4	215
Earlham College	"	..	..	..	..	..	..	..	..	1	20	21	212
Knox College	Ill.	..	1	..	..	..	..	1	..	2	54	58	306
McKendree College	"	..	..	..	..	..	..	..	..	..	48	48	219
Monmouth College	"	..	..	..	..	..	..	1	..	8	98	107	370
Lincoln University	"	..	..	..	..	..	..	..	..	..	41	41	210
Illinois College	"	..	..	..	..	..	..	..	..	..	40	40	40
North Western Univ. 1870–71	"	..	..	..	..	..	..	7	..	1	64	72	337
Augustana College and Sem.	"	..	..	..	..	..	..	..	..	..	..	..	58

TABLE V.—*Continued.*

Universities and Colleges of the United States.	State.	Maine.	New Hamp	Vermont.	Mass.	R. I.	Conn.	New York.	N. J.	Penn.	Other States.	Students of Arts.	Total of all descriptions.
University of Chicago	Ill.	..	..	..	..	..	..	..	..	..	..	..	346
Illinois Wesleyan University	"	..	..	..	..	..	..	..	1	..	12	13	156
Illinois Soldiers' College	"	..	..	..	..	..	..	..	..	..	..	..	187
Eureka College	"	..	..	..	..	..	..	..	..	..	119	119	172
Illinois Indust. University	"	..	..	..	..	..	..	..	..	..	..	..	179
Lombard University	"	..	1	..	..	1	..	..	..	..	12	14	186
Shurtleff College	"	..	..	..	..	..	..	1	..	..	31	32	125
Quincy College, 1868–69	"	..	..	..	..	..	..	..	..	..	11	11	334
Wheaton College, 1868–69	"	..	..	..	..	..	..	..	..	..	20	20	239
University of Michigan	Mich.	1	..	..	..	..	1	8	..	1	161	172	1112
Hillsdale College	"	1	..	..	..	..	..	6	..	..	40	47	521
Adrian College	"	..	..	..	..	..	..	1	..	..	11	12	103
Olivet College, 1870-71	"	..	..	..	..	..	..	..	..	..	21	21	234
Albion College	"	..	..	..	..	..	..	1	..	..	15	16	216
Kalamazoo College, 1870–71	"	..	..	..	..	..	..	..	..	..	34	34	146
Beloit College	Wis.	..	..	..	..	..	1	..	1	..	75	77	230
Lawrence University	"	..	..	..	..	..	..	1	..	..	20	21	267
Racine College	"	..	..	..	..	..	..	1	..	2	40	43	184
Ripon College	"	..	..	1	..	..	..	..	..	..	24	25	330
University of Wisconsin	"	..	..	..	..	..	..	..	..	..	38	38	485
Northwestern University	"	..	..	..	..	..	..	..	..	..	7	7	133
Iowa College	Iowa.	..	1	..	1	..	..	..	..	..	33	35	257
Griswold College	"	..	..	..	..	..	..	1	..	2	11	14	115
Simpson Centenary College	"	..	..	..	..	..	..	..	..	..	14	14	190
Iowa State University	"	..	..	..	..	..	..	..	..	..	..	..	434
Cornell College	"	..	..	..	..	..	..	..	..	1	64	65	352
Iowa Wesleyan Uni., 1868–69	"	..	..	..	..	..	..	..	..	..	45	45	278
Whittier College, 1868–69	"	..	..	..	..	..	..	..	..	..	10	10	159
Westminster College	Mo.	..	..	..	..	..	..	..	..	..	117	117	123
Wm. Jewell College	"	..	..	..	..	..	..	..	..	..	19	19	127
University of Missouri	"	..	..	..	..	..	..	..	..	..	11	11	243
Washington Univ., 1870–71	"	..	..	..	..	..	..	..	..	..	25	25	747
Lewis Male and Female Col.	"	..	..	..	..	..	..	..	..	..	..	..	92
Kansas St. Ag. Col., 1868–69	Kan.	..	..	..	..	..	..	..	..	..	15	15	170
Washburn College	"	..	..	..	..	..	..	..	..	..	5	5	45
Pacific Methodist Col., 1868–9	Cal.	..	..	..	..	..	..	..	..	..	26	26	210
University of Cali., 1870–71	"	..	..	..	..	..	..	..	..	..	..	..	764
University of the Pacific	"	..	..	..	..	..	..	..	..	..	9	9	144
Wallamet Univ., 1868–69	Ore.	..	..	..	..	..	..	..	..	..	15	15	227
University of Alabama	Ala.	..	..	..	..	..	..	..	..	..	54	54	54
Howard College	"	..	..	..	..	..	..	..	..	..	..	..	184
St. John's College	Ark.	..	..	..	..	..	..	..	..	..	80	80	80
Northfield College, 1870–71	Minn.	..	..	..	..	..	..	..	..	..	..	..	160
Louisiana State University	La.	..	..	..	..	..	..	..	..	.	..	..	217
Total 153 Coll. and Univ.	..	293	179	221	738	107	244	1370	293	896	549[illegible]	9829	3 ,459

ANNUAL REPORT

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ON THE QUESTION

"DO SNAKES SWALLOW THEIR YOUNG?"

BY

G. BROWN GOODE.

[From the Proceedings of the American Association for the Advancement of Science.
Portland Meeting, August, 1873.]

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ON THE QUESTION "DO SNAKES SWALLOW THEIR YOUNG?" By G. BROWN GOODE, of Washington, D. C.

IT has long been a popular belief that the young of certain snakes seek temporary protection from danger by gliding down the open throat of the parent. This has been doubted by many naturalists, and the general disposition has been to class the belief among the popular superstitions. This paper is intended to sum up the evidence, which will show, it is hoped conclusively, that the popular idea is sustained by facts.

Allusions to this habit are found as early as the sixteenth century. In the "Faerie Queene," Spenser describes Error in these words:—

"But full of fire and greedy hardiment
The youthfull knight could not for ought be staide:
But forth unto the darksom hole he went,
And looked in: His glistring armor made
A litle glooming light, much like a shade;
By which he saw the ugly monster plaine,
Halfe like a serpent horribly displaide,
But th' other halfe did womans shape retaine,
Most lothsom, filthie, foule and full of vile disdaine.

"And, as she lay upon the durtie ground,
Her huge long taile her den all overspred,
Yet was in knots and many boughtes upwound,
Pointed with mortall sting. Of her there bred
A thousand yong ones which she dayly fed,
Sucking upon her poisnous dugs; each one
Of sundrie shapes, yet all ill-favored:
Soone as that uncouth light upon them shone,
Into her mouth they crept, and suddain all were gone.

* * * * * * * * * * *

"*She poured forth out of her hellish sinke*
Her fruitful cursed spawne of serpents small,
Deformed monsters, fowle and blacke as inke
Which swarming all about his legs did crall,
And him encombrd sore, but could not hurt at all.

* * * * * * * * * * *

"Her scattred brood, soone as their parent deare
They saw so rudely falling to the ground,
Groning full deadly all with troublous feare
Gathred themselves about her body round,
Weening their wonted entrance to have found
At her wide mouth; but, being there withstood,
They flocked all about her bleeding wound,
And sucked up their dying mothers bloud
Making her death their life, and eke her hurt their good."

["*The Faerie Queene,*" 1590, *Book* 1, *Canto* 1, *vv.* 14, 15, 22 *and* 25.]

In Browne's "Vulgar Errors" may be found the following account of the Viper:—"For the young ones will upon any fright for protection run into the belly of the Dam; for then the old one receives them in at her mouth, which way, the fright being past, they will returne againe; which is a peculiar way of refuge, and though it seems strange is avowed by frequent experience and undeniable testimony."*

Gilbert White refers to the prevalent belief in this habit of the viper, and though rather inclined to favor it, he is evidently shaken in his faith by the adverse testimony of the London viper-catchers.†

M. Palisot de Beauvois, an eminent French naturalist, published in 1802 some very important observations on the rattlesnake, which will be quoted hereafter.

S. John Dunn Hunter, an early traveller in the United States, says:—"When alarmed, the young rattlesnakes, which are generally eight or ten in number, retreat into the mouth of the parent and reappear on its giving a contractile muscular token that the danger is past."‡ A few years later a long discussion occurred in the "Gardener's Chronicle" which, however, reached no satisfactory conclusion.

In a note to the eighth edition of "Selborne," Sir William Jardine says:—"The question remains, we believe nearly as it did in White's time. The supposed habit is so much at variance with what we know of the general manners and instincts of animals, that without *undoubted proof* of its occurrence we are inclined to consider it as a popular delusion."§

In 1865 Mr. M. C. Cooke, editor of "Science Gossip," made a strong argument in the affirmative.‖

Mr. F. W. Putnam published in the year 1869¶ a very thorough discussion of the question. He speaks of it as still unsettled and, though sympathizing fully with Mr. Cooke, asks for additional proof.

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* "Pseudodoxia Epidemica: or, Enquiries into very many received Tenents and commonly presumed Truths. By Thomas Browne, Dr. of Physick." London, 1646, p. 143.

† "The Natural History of Selborne," 1789, Series 1, letter xvii; Series 2, letter xxxi.

‡ "Memoirs of a Captivity among the Indians of North America," London, 1823, p. 170; and "North American Review," 1826, pp. 54, 95-107.

§ "Natural History of Selborne," London, 1853, p. 58.

‖ "Our Reptiles," London, 1865, p. 58.

¶ "American Naturalist," vol. ii, p. 173. To this article, which first interested me in the subject, I owe many valuable suggestions. I am also indebted to Prof. Baird, to Prof. Theo. Gill, to Prof. W. N. Rice of Middletown and to Mr. James Simson of New York, who have called my attention to facts which would otherwise have escaped my notice.

During the past year an animated discussion has been carried on in the London "Land and Water." Mr. James Simson and others have argued for the affirmative but Frank Buckland, the editor, classes the belief among the numerous popular delusions and persistently refuses to believe until he or some other naturalist has personally investigated the subject.

The feeling of the majority of naturalists at the present time seems to be well expressed in these words:—"The cumulative testimony of many witnesses would compel us to receive this supposed habit as an established fact, did not experience warn us of the extreme liability of untrained observers to be misled by preconceived opinions. The fact that no competent naturalist has found young vipers in the stomach or œsophagus of the mother raises a strong presumption, on the doctrine of probabilities, of its being a mere delusion. The habit moreover would be contrary to the ordinary laws of animal instinct which lead both parent and offspring to adopt the best available means for the preservation of the race.*

Theorizing upon this question has proved useless, and it is obvious that it can only be settled by the statements of persons who have seen the act. Believing that none would be so likely to supply the desired facts as those whose vocation brings them into daily contact with snakes in their native haunts, I wrote a short note to Mr. Orange Judd, Editor of the "American Agriculturist," which he kindly inserted in the issue of that magazine for February, 1873.

As a result over eighty letters were received, from persons in twenty-four states and provinces, almost every one containing valuable evidence. Many of the writers seem indignant that a fact so well known to them should be questioned. On the depositions of these witnesses, together with those collected by diligent personal inquiry, the case must rest.

A farmer living in Mechanicsburg, Ohio, writes:—"In 1835 I saw on the bank of Deer Creek a large water-snake. I procured a pole for the purpose of killing her. One stroke slightly wounded her and she immediately made for the water; after she had swam about her length she wheeled, placing her under jaw just out of the edge of the water, then opening her mouth to the fullest extent. Some dozen young snakes, three to four inches long then seemed to run or rather swim down her throat, after which she clumsily turned in search of a hiding place. I opened her and found about twenty living young snakes, two or three seven or eight inches long."

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*"D" (Yorktown, Virginia) in "Land and Water," xv, p. 78, Feb. 1, 1873.

A gentleman in Georgetown, S. C., writes:—"I had for several days noticed a very large moccason coiled around the limb of a small tree near the pond. I concluded to capture it and accordingly procured a large rabbit and placed it some way up from the pond to toll her away from the water. She soon came down and disappeared under a large log; when next seen she was near the bait, having traced it along the log on its opposite side. When she had nearly swallowed the bait we made an advance; quickly disgorging it she gave a shrill whistling noise, and five young snakes ran from under the log and ran down the throat of the old one. We cut off her head and found the five young, which made efforts to get away."

A farmer in Rosendale, N. Y., writes:—"I was one day mowing and coming close to a smooth flat rock, I thought I saw as many as a dozen snakes on it. I ran for a fork which was standing within a few yards and when I came back there was only one snake on the rock. I struck it on the back and seven snakes ran out of the mouth."

A letter from Chesterfield, N. H., says:—"I saw a striped snake on the hillside, and noticed something moving about her head, and counted twenty little snakes, from one and a half to two inches long. I made a move and the old one opened her mouth and they went in out of sight. I stepped back and waited and in a few moments they began to come out. Then I made for the old snake and killed her and forced out several."

A farmer in Newburyport, Mass., writes:—"Riding through a large corn field, in the centre of which was a large shelving rock I observed on the top a curious commotion, but on near approach found nothing. My curiosity was excited, and the next day I repaired to the spot very cautiously, and on the top of the rock saw an enormous striped snake sunning herself, surrounded by a bevy of young four to six inches long. After viewing them to my satisfaction I made a demonstration, and to my surprise the old snake opened her mouth very wide, the little snakes ran down her throat and then she disappeared in the shelving rock. I repeated the experiment a number of days to the same effect."

The total number of testimonies in my possession is one hundred and twenty. Sixty-seven witnesses saw the young snakes enter the parent's mouth; twenty-two of these heard the young warned by a whistle or hiss or click or sound of the rattles; five were considerate enough to wait and see them reappear when danger seemed over; one seeing the act repeated on several days.

Three saw young snakes coming out of a large one's mouth, and not having seen them enter were naturally much astonished. Five struck the parent and saw the young rush from its mouth; eighteen saw the young shaken out by dogs or running from the mouth of the dead parent. Thirty-six of those who saw the young enter the parent's mouth, found them living within its body. Only twenty of the sixty-seven allowed the poor, affectionate parent to escape. Thirty-three who did not see the young enter, found them living within the parent's body. Testimony of this character concerning the ovo-viviparous species is, however, to say the least, dubious.

It may be objected that these are the testimonies of laymen, of untrained observers, of those who might be influenced in their observations by their prejudices. I reply that the letters are from a class of well-informed farmers, mechanics and business men, intelligent readers of a practical agricultural magazine. The act of swallowing the young is of such a character as to admit little room for error in the observations, and I find that, as a general rule, opinions on the subject are current only among those who have had it brought to their notice by their own experience or that of their friends. Due weight should be given to the wide distribution of the witnesses, and the remarkable concurrence in their statements.

Let us not, however, trust entirely to the statements of the untrained observer. Says Mr. Cooke:—"Clergymen, naturalists, men of science and repute, in common with those who make no profession of learning, have combined in this belief."* We add the statements of gentlemen, the accuracy of whose observations in other departments of natural history would surely not be doubted. Prof. Sydney I. Smith, of the Sheffield Scientific School, saw a ribbon-snake (*Eutœnia saurita*), about two feet long, accompanied by two young ones of three or four inches; on a hiss from the parent they disappeared down its throat. The parent was killed and two ran out of the mouth, while a third was found alive in the body. Dr. Edward Palmer, a well known traveller and collector, assures me that when in Paraguay with the "Waterwitch" expedition, he saw seven young rattlesnakes (*Caudisona terrifica*) run into their parent's mouth. After it was killed they all ran out. These snakes, parent and brood, are preserved in the U. S. National Museum, Washington.

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*"Our Reptiles," p. 76.

Rev. Chauncey L. Loomis, M.D., of Middletown, Conn., a keen and enthusiastic observer, saw a black snake (*Coluber Alleghaniensis?*) open its mouth, allow seven young ones to enter and then glide away.

D. L. Phares, M.D., of Woodville, Miss., writes:—"A few years ago a gentleman, directing some hands at work on my lawn, heard a low, blowing noise, and on looking saw a large water moccason (*Toxicophis piscivorus*, I believe) and a large number of young hurrying to her head and disappearing so rapidly that he first thought they ran under her. He soon discovered that they went into her slightly opened mouth, which was held close to the ground till they had all entered. She then attempted to escape, but was cut in two with a hoe. We took from her a large number of young, eight or ten inches long."

I might take from Mr. Cooke's work several statements equally to the point. I quote from the "Zoologist" a note concerning the scaly lizard (*Zootoca vivipara*), which has an important bearing upon the question. Says the editor, Mr. Newman:—"My late lamented friend, William Christy, Jr., found a fine specimen of the common scaly lizard with two young ones; taking an interest in everything relating to natural history, he put them into a small pocket vasculum to bring home, but when he next opened the vasculum the young ones had disappeared, and the belly of the parent was greatly distended; he concluded she had devoured her own offspring. At night the vasculum was laid on a table and the lizard was therefore at rest; in the morning the young ones had reappeared and the mother was as lean as at first."*

Mr. Putnam has kindly put into my hands a note from Thomas Meehan, of Philadelphia, containing strong affirmative testimony in the case of the English viper as observed by him in the Isle of Wight; also a note from Herman Strecker of Reading, Pa., who says:—"Some years ago I came across a garter snake (*Eutœnia saurita*) with some young ones near her. Soon as she perceived me she hissed and the young ones jumped down her throat, and glided beneath a stone heap. Another time I caught a snake of the same species, but as I thought of immense size, which I took home and put in a cage; on going to look at her some short time afterwards I discovered a great number of young ones (about thirty if I recollect rightly) and whilst I was still looking at the sudden increase, two more crept out of the old one's mouth, and finally after a little while a third one did likewise."

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* "The Zoologist," p. 2269.

Prof. C. F. Brackett, of Princeton College, sends me a note which, besides throwing light upon the question under consideration, gives a very interesting instance of hereditary instinct: he writes:—"About twenty-five years ago I saw the following things. A workman who was mowing in my father's hay-field came upon a moist, moss-grown knoll, and his scythe cleft off a portion of the thick moss and sphagnum and revealed several (at least a dozen, I should say) small soft bodies which he declared to be snakes' eggs. I at that time having no knowledge of such matters was incredulous, and proceeded to tear one of them open, when, to my surprise, there appeared a small, perfectly formed milk adder, which immediately assumed a pugnacious attitude, and brandished its tongue as defiantly as an old snake would have done. Other eggs were torn open with like results. Soon the old snake appeared and after endeavoring, apparently to encourage the young family, thus suddenly initiated into the world, it put its mouth down to the ground, and every one that had been liberated from the egg voluntarily and hastily disappeared within the abdomen of the old one (mother?). Last of all I put the point of a pitchfork through the old snake and fulfilled the scriptural injunction of bruising its head, when with a pocket knife I opened the abdomen and found the young ones still active."

The snake referred to by Prof. Brackett is apparently the common milk-snake (*Ophibolus triangulum*).

Col. Nicolas Pike, late U. S. Consul at the Mauritius, assures me that he has seen the garter-snake (*Eutœnia sirtalis*) afford its young family temporary protection in its throat, from which they were soon noticed to emerge.

Our last witness is one who appears to have been overlooked throughout this discussion, one whose statement, it would seem, ought of itself to have decided the question long ago. M. Palisot de Beauvois, an eminent French naturalist, member of the Institute and Councillor of the University of Paris, thus details an observation made near the close of the last century:—"When making my first excursion into the Cherokee country,* I happened, while botanizing, to see a rattlesnake in my path. I approached as softly as possible, but, just as I was about to strike, imagine my surprise to see it, after sounding its rattle, open a very large mouth and receive into it five little serpents, each about the size of a goose-quill. Astonished at this singular spectacle I retired some distance and hid behind a tree. After some minutes, the animal, believing itself out of danger, again opened its mouth and allowed the little ones to escape. I advanced, the little ones retreated to their stronghold, and the mother, carrying her precious treasure, disappeared among the underbrush where I was not able to find her."†

We have the opinion of Dr. Jeffries Wyman,‡ Prof. Gill and other physiologists, that there is no reason why the young snakes may not live for a time within the parent. It would be very difficult to smother a reptile, even in such close quarters, and lizards, toads and snakes have often been rescued, unharmed, after a sojourn in a snake's stomach. It is a well known fact that living tissues are acted upon very feebly by the gastric juice.§

The supposition that the serpents swallow their young for food is manifestly absurd, for the act is purely voluntary with the young snakes. If the habit is not protective in its design, it must be destructive to a degree that will in time exterminate the species which practise it.

An analogous case is found among certain South American fishes of the genera *Geophagus*, *Arius* and *Bagrus*, the males carrying the eggs in their mouths, depositing them in places of safety and removing them on the approach of danger.‖

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* The Cherokees were at this time joint-owners of the states of Tennessee, Mississippi and Alabama, with the western portions of North Carolina and Georgia.

† Beauvois, "Observations sur les Serpens" in Daudin's "Histoire Naturelle, Générale et Particulière des Reptiles" Paris, An. Rep. xi (1803), vol. v, p. 65.

‡ "American Naturalist," vol. ii, p. 137.

§ Flint's "Physiology of Man," New York, 1871, vol. ii, pp. 275–282.

‖ Wyman, "Proceedings of the Boston Society of Natural History," vol. vi, p. 328, 1858. "American Journal of Science and Arts," vol. xxvii, 1859, p. 11. Günther "Catalogue of the Fishes in the British Museum," vol. v, 1864, p. 173.

I have been told of two instances where a large snake was found to contain one of smaller size, which in its turn had within it a number still more diminutive. This may be easily explained by supposing the parent snake, after affording the usual protection to its young brood, to have been swallowed by some hungry reptile of larger size.

The American Indians seem to have had some knowledge of this peculiar habit of the rattlesnake. Among the many legends collected by Maj. J. W. Powell, U. S. Geologist, in his researches among the Pai Utes, is one giving the origin of the echo. An old sorceress was suspected of wrong doing and was pursued by her enemies until in desperation she sought aid from her grandfather, "Takoa," the rattlesnake. His only resource was to open his mouth and allow the old witch to crawl in out of sight and out of danger. She was so well pleased with her safe retreat that she could not be induced to leave it, so the rattlesnake had to crawl out of his skin and leave her within. And there, say the Pai Utes, she remains to this day, and when any one calls she mockingly repeats their words from her hiding place in the cast off snake-skin.

This curious tradition, even if it cannot be counted as evidence, shows in an interesting way the wide prevalence of this belief.

There is much need of other observations, to determine what species of American snakes have this singular habit. Thirty-four of the observations relate to *Eutœnia;* the habit is probably shared by all the species, but is only well attested for the garter snake (*Eutœnia sirtalis*) and the ribbon-snake (*Eutœnia saurita*). Seventeen refer to the water-snake (*Tropidonotus sipedon*). Nine refer to the banded rattlesnake (*Caudisona horrida*), two to the copperhead (*Ancistrodon contortrix*), three to the moccason (*Ancistrodon piscivorus*) and one to the massasauga (*Crotalus tergeminus*). Does the habit extend throughout the *Crotalidœ?* One instance is given for the blowing-adder (*Heterodon platyrhinos*) and three for the mountain black snake (*Coluber Alleghaniensis*). Six relate to the so-called "black snake," but this name is too indefinite. With all deference to Mr. Buckland, I believe the case of the viper (*Pelias berus*) to be settled, as well as that of *Zootoca.* Whether the male snake ever protects the young in this way has not been observed.

It is a noteworthy fact, which may or may not prove an important one, that the snakes mentioned above are all ovo-viviparous with the exception of Ophibolus. There is nothing to indicate that the habit is shared by the oviparous snakes of the genera *Liopeltis*, *Cyclophis*, *Storeria*, *Diadophis*, and *Pityophis*. The case of *Bascanion*, which is oviparous, is still quite problematical, and it remains to be shown whether the "black snake" of my correspondents is *Coluber Alleghaniensis*, or *Bascanion constrictor*. Mr. Gosse gives facts which make it seem quite probable that the Jamaica boa (*Chilabothrus inornatus*) may share the habit.[*]

The breeding habits of North American snakes deserve careful investigation, as they are totally unknown in more than twenty-five of the genera.

[*] "A Naturalist's Sojourn in Jamaica," London, 1851, pp. 318–23, 501. There is reason to believe that some of the Eutænias, like the scaly lizard (*Zootoca vipara*) are in some instances oviparous, in others ovo-viviparous, and this point should be kept in mind in making observations upon that and other genera.

[Printed at the SALEM PRESS, April, 1874.]

[For The Sentinel & Witness.]

Animals in the Drinking-Water.

Mr. Editor :

Last summer Prof. Rice found in his well water about twenty specimens of a small crustacean, a half-inch in length. Specimens were sent to Prof. Sydney I. Smith, of the Sheffield Scientific School, Yale College, one of the best living authorities on this group of animals. He writes me that they are extremely interesting, belonging to the genus *Crangonyx*, and *to a species entirely* NEW. This genus had been known in America only from dredgings in Lake Superior at a considerable depth. Two years ago a specimen was found in the city water, which proved to belong to the genus *Nephragus.* This had been found in wells in Norway and other parts of Europe, but never before in America, except in Lake Superior. The animals belong to the order of *amphipodous* crustaceans and are own cousins to the "sand hoppers" so common on the sea-shore. They have affinities with the shrimp and also with the lobster, and on examination we may detect a remote resemblance to a miniature lobster.

I wish to suggest the great importance of preserving any animals which may be found in our city or well water. If they cannot be sent at once to the Museum they may be dropped into a small phial of alcohol.

G. BROWN GOODE.

College Museum, Sept. 18. 1873.

CRANGONYX TENUIS, *sp. nov.*

A slender, elongated species, with very low epimera, resembling more in form the species of *Niphagus* than the typical species of *Crangonyx*.

Eyes not observable in alcoholic specimens. Secondary flagellum of the antenulæ very small, composed of two segments, of which the terminal is very short.

First and second pairs of legs differing but little in the two sexes. First pair stouter than the second, and with the palmary margin of the propodus much more oblique; the palmary margin of the propodus of both pairs, and in both sexes, armed each side with a series of stout, obtuse spines, with a notch and a cilium near the tip.

First three segments of the abdomen longer than the last three of the thorax; fourth, fifth, and sixth together scarcely longer than the third. Caudal stylets all extending to about the same point. First pair with the rami subequal, scarcely half as long as the peduncle. Peduncle in the second pair reaching a little beyond the peduncle of the first pair; the rami very unequal, the outer only half as long as the inner. Posterior pair scarcely as long as the telson; the single terminal segment very small, and tipped with four or five setiform spinules. Telson two-thirds as broad as long, tapering very slightly toward the entire and slightly arcuate posterior margin, which is armed with about ten slender spinules.

In the largest male seen, $13^{mm}.5$ in length, (excluding the antennæ,) the antennulæ are about 5^{mm} long; the flagellum being twice as long as the peduncle, and composed of about twenty-two segments, while the antennæ are stout, fully 6^{mm} long, and the flagellum as long as the peduncle, and composed of fifteen segments. All the females and most of the males which I have seen are much smaller, being 6^{mm} to 8^{mm} in length, and in these the antennulæ are longer than the antennæ; and the flagellum of the antennulæ is composed of sixteen to nineteen segments, while that of the antennæ has only eight to ten.

The only specimens which I have seen were found in wells at Middletown, Conn., and were sent to me by Mr. G. Brown Goode.

PLATE XIII. Fig. 2. Harris's Point pound, Eastport, Me. Drawn by G. B. Goode.
Fig. 3. Herring-weir, near Eastport, Me. Drawn by G. B. Goode.

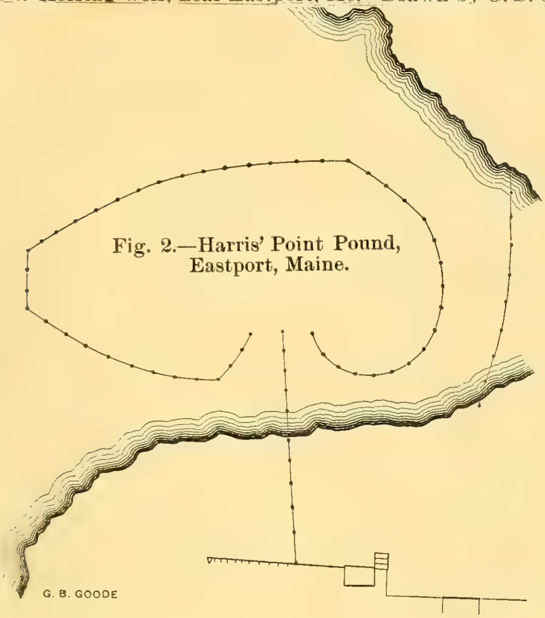


Fig. 2.—Harris' Point Pound, Eastport, Maine.

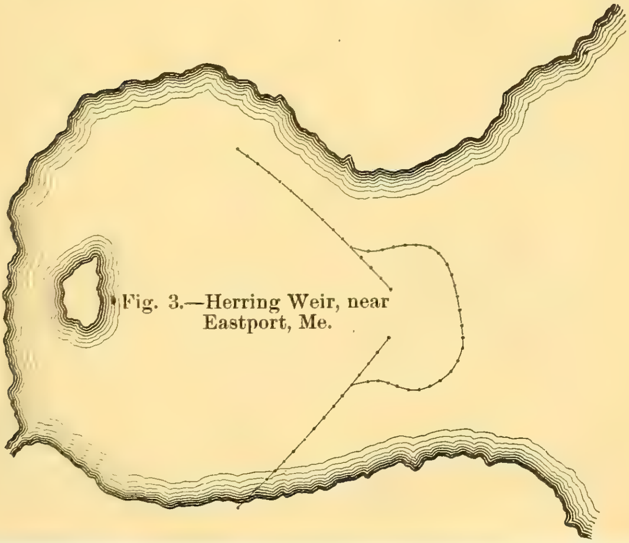


Fig. 3.—Herring Weir, near Eastport, Me.

Plate XIII.

Rept U.S. Com. Fish & Fisheries
1872-3.

Do Snakes Swallow their Young?

BY PROF. G. BROWN GOODE.

This is what naturalists have been asking each other for nearly a century. In that most fascinating of books, "The Natural History of Selborne," Gilbert White mentions the popular belief, but does not venture to indorse it. M. Palisot de Beauvois, a member of the French Institute and a councilor of the University of France, who traveled in the United States early in the present century, claimed to have seen five young rattlesnakes, "each about as thick as a goose quill," run down their mother's throat, run out, and then down a second time. John D. Hunter, in his celebrated "Memoirs of a Captivity among the Indians of North America," gives similar testimony. Sir William Jardine, an eminent English naturalist, wrote in 1853: "We have always looked upon this as a popular delusion, and the supposed habit is so much at variance with what we know of the general manners and instincts of animals, that without *undoubted proof* we are still inclined to consider it as such." In 1865 Mr. M. C. Cooke, of "Science Gossip," strongly advocated the affirmative, citing many instances observed by his friends. In 1869 Mr. F. W. Putnam, of the "American Naturalist," considered the case unproved, though he inclined to believe with Mr. Cooke. During the past year a lively discussion has been carried on in "Land and Water," Mr. Frank Buckland, one of the keenest of English naturalists, strenuously opposing the idea. So stood the question, the authorities being about equally divided.

To the *American Agriculturist* is due the honor, it seems, of finally deciding it. Last February the editors kindly inserted a paragraph asking for information, and in a few weeks about eighty letters had been received from subscribers in twenty-four different States and provinces. Some of these were not

to the point, but most of them contained the statements of those who had personally observed this very curious habit. Many were, very naturally, indignant that a fact so well known should be called in question.

These statements, together with many others collected by diligent personal inquiry, were embodied by the writer in a paper read at the late meeting of the American Association for the Advancement of Science. The paper elicited some discussion but no opposition. Prof. Gill, of Washington, one of the most skeptical as well as one of the ablest of American scientists, expressed himself as convinced by the testimonies of so many witnesses, and so did many others.

Many of the letters received deserve to be printed in full; but since want of space forbids, only figures can be given. Our witnesses are 104 in number. 58 saw the young enter their mother's mouth; 19 heard the mother warn them by a sharp whistle or hiss or click; three were considerate enough to wait and see the young reappear when danger seemed to be passed; eighteen saw the young shaken out by dogs or running from the mouth of the dead mother; 32 who saw the young enter killed the mother and found them, living, within her; while only 14 of the 58 allowed the poor, affectionate parent to escape; 29 found the young in the body of the parent, but as they did not see them enter the mouth this testimony is rather dubious.

Among the witnesses are four naturalists of reputation, whose word is as good as gold in other departments of natural history. Eminent physiologists admit that there is nothing impossible in the habit, for living tissues are not easily affected by the gastric juice, and reptiles could not easily be smothered, even in the mother's stomach. The habit is known to be shared by the English Scaly Lizard. The males of certain species of South American fishes related to the "Cat-fish" and "Bull-head" carry their eggs in their mouths and gill openings,

depositing them in places of safety and removing them at the approach of danger. Equally singular though not similar habits of protecting the young are found in the well-known Surinam Toad, in the Kangaroo and Opossum, and in the Pipe-fish and his cousins.

There is room for many interesting observations, especially to determine what species afford their young this protection. About the Garter-snake (*Eutania sirtalis*) and the Ribbon-snake (*Eutania saurita*), the Water-adder (*Tropidonotus sipedon*), the Banded Rattlesnake (*Caudisona horrida*), the Copperhead (*Ancistrodon contortrix*), the Moccasin (*Ancistrodon piscivorus*), and the Massasauga (*Crotalus tergeminus*) there can be little doubt, and the habit probably extends throughout the genera which these species represent. The case of the Hog-nosed-snake (*Heterodon platyrhinos*), sometimes called the Blowing or Puffing Adder, needs farther investigation, and so also that of the Black-snakes. It seems more than likely that the Racer or Mountain Black-snake (*Coluber Alleghaniensis*), which is distinguished by a little ridge or carination in the middle of each scale, does thus protect its young, but it has not been shown that this is the case with the common smooth-scaled Black-snake (*Bascanion constrictor*). It is very desirable to learn whether, as has been supposed, the habit is peculiar to those snakes which are ovoviviparous—that is, those in which the young are hatched from the egg while still in the body of the parent. As was remarked, there is no proof that the Black-snake swallows its young, and this is the case with all the egg-laying genera, as the Milk-snakes (*Ophibolus*), Grass-snakes (*Liopeltis* and *Cyclophis*), Brown-snakes (*Storeria*), Ring-necked-snakes (*Diadophis*), and Bull-snakes (*Pityophis*), although they are common and easy to observe.

If any reader of the *Agriculturist* should observe a snake with young running down her throat, or should have reason to believe that she had them in her stomach, it would be a

capital plan to tie a cord tightly about her neck to prevent their escape, and then carry her to some naturalist or some physician and have a careful dissection made. This would forever settle the question, and might be done without the least difficulty, for all our snakes except the Rattlesnakes, Moccasins, Copperheads, and Massasaugas are perfectly harmless.

Accurate statements are much needed of cases of snakes *charming* men, quadrupeds, and birds. It would be interesting to know whether the cast-off skin of a snake is always left as the snake wore it, or whether it is sometimes turned inside out.

Museum, Wesleyan University,
Middletown, Ct., Sept. 15.

Am. Nat. Nov 1873

Armorial Bearings.

GOODE.

Arms. Gules, a chevron, or between three lions rampant argent.

Crest. Head of a leopard red ducally crowned.

GOOD.

Arms. Gules, a chevron or between three lions rampant. or.

Crest. An otter passant standing on a ducal coronet. or

GOOCH or Good

Arms. Gules, a chevron, or, between three lions rampant or.

Crest. A leopard argent spotted sable standing on a ducal coronet or.

SNAKES SHEDDING THEIR SKINS.

Editor Forest and Stream:—

I once had the chance to see a snake shed his skin. I think it was in the month of June. I was standing in the field when I observed a striped snake going through some strange contortions, turning first on his back and then on his side, and all this time his head was kept in between two small sprouts about half an inch apart. I thought at first he was insane, or performing for the circus, but in a few moments all was made plain; he was getting the old skin started from around his mouth. At last it gave way, and began to roll over his back, and he soon pulled himself out of it, and left the skin turned completely wrong side out. He then went on his way, acting as though he felt very happy.

Question: Do all snakes shed their skins? and if so, do they shed them more than once in a year? and will snakes freeze and then thaw out and live, as worms, ants, bugs, etc., do? I have found that striped snakes will drown under water in a short time. Now, how is the water adder constituted that he can remain under water? Will some of your correspondents please explain? I found on examination that the snakes shed a covering to their eyes, and I am inclined to the belief that they can see but little, if any, for some days prior to shedding their skins, and lie around inactive. J. L. Hersey.

Editor Forest and Stream:—

Mr. Hersey's letter is quite interesting, and I hope it will induce others to send to Forest and Stream their observations on the subject. His queries, too, are very suggestive, though they forcibly remind the reader that it is easier to ask questions than to answer them.

Do all snakes shed their skins, and if so do they shed them more than once in a year?

All snakes do shed their skins, the first moult occurring soon after the young snake is born. The moults are repeated at intervals of a month or two during the warm season, but in winter none occur. In captivity the shedding of the skin is not so frequent, and is very laborious and painful, sometimes resulting in death.

The shed skin is usually turned completely inside out, as in the case mentioned by Mr. Hersey. Whether this is always so is a question on which we need more light. Mr. James Simson, an enthusiastic correspondent of *Land and Water*, insists that they are frequently left "as the snake wore them." Frank Buckland is equally positive that this never occurs. I have in my possession the skin of a moun-

tain black snake (*Coluber Alleghaniensis*) nearly seven feet long, which is inverted as neatly as a glove finger could be, and without a tear in it; also, an inverted skin of the common black snake, (*Bascanion constrictor*). I have a skin shed in November by a rattlesnake (*Candisona horrida*), afterwards a pet of mine, which remains in its natural position. I did not see the operation of moulting, and it is barely possible that the skin may have been turned while fresh and soft, but I do not believe that it was ever completely inverted. I should state that the snake was not in captivity when he shed this skin, but was taken just after the act of moulting.

"*Will snakes freeze and then thaw out?*"

Spallanzani kept snakes, frogs, and salamanders in a state of torpor in an ice house for three years and a half, and then easily restored them to activity. In our climate snakes retire at the approach of cold weather into their winter retreats in old burrows, hollow trees, or stone heaps, and there they remain, hibernating, until they are revivified by the warm rays of the spring sun. It would seem as if they would often be exposed to a freezing temperature. I have found the common toad, in the early spring thaws, hibernating in the soil a foot or two below the surface, where it must have been surrounded throughout the winter by solid walls of frozen earth. A pet black snake, confined in a well ventilated, unwarmed room, endured weather when the mercury stood at zero in the open air, but succumbed at twenty degrees below. I attribute his death by freezing to the fact that he was not in a state of complete hibernation, as he had frequently been handled during the early winter, and thus partially aroused from his stupor. A very interesting series of experiments could be made upon the hibernation of reptiles.

"*How is the water adder constituted that he can remain under water?*"

Cold blooded animals, such as serpents, consume little food, and, even when in activity, little oxygen, in this respect forming a marked contrast with highly vitalized, warm blooded animals. Birds, for instance, in their nervous, restless activity, require incredibly large supplies of food and a miniature blast furnace of oxygen to supply the incessant waste of their tissues. Serpents, on the contrary, pass the greater part of their lives in a state of sluggish repose, much like that of the higher animals in hibernation. Hibernating mammals can be kept under water for an hour at a time without harm, though three or four minutes would be sufficient to kill them if they were in their natural state of activity. The nearly complete suspension of all the functions of life reduces the demand for air, as

for food, almost to zero. The water snake, coiled up under a stone at the bottom of a pond is not in a condition to demand large supplies of oxygen. Still he requires some, and a brief glance at his breathing apparatus will show us where he gets it. Like most other serpents, he has only one lung, the other being present merely as a rudiment. This lung extends a good deal more than half the length of his body, and the lower part is expanded into a membranous sac, or bag, capable of containing a considerable quantity of air. This bag stands Mr. Tropidonatus sipedon in good stead in more ways than one. When he dives he swallows his meal in a single mouthful, which is so ungenteelly large that it presses against his windpipe and stops his breathing, so that for the time being he must get his oxygen from his internal reservoir. Then when he makes a voyage under water he can carry with him a cargo of good fresh air.

I have not compared the lungs of the water and land snakes, but I imagine that very little difference would be detected. Professor Agassiz made a very interesting series of experiments with a view to determining the relative lung capacities of land and water turtles. He proceeded by pumping all the air from the living turtle, then pumping them full of water, then pumping out and measuring the water. He found that the capacity of the lungs of the land turtle averages twice as much in proportion to the weight of the body as that of the water inhabiting species, although the sea turtles carry a sufficient supply of air in their lungs to enable them to remain under water a half hour or more.

It will be found that water animals, as a rule, have their breathing organs much smaller than land animals. This apparent paradox is explained by the fact that a large amount of oxygen may be absorbed by the skin from the air diffused through the water. G. Brown Goode.

Smithsonian Institution, January 3, 1874.

Mr. G. Brown Goode, of the Smithsonian Institution, has been in Florida during the past winter, making a collection of beasts, birds, and reptiles for the Zoological Gardens in West Philadelphia. Quite a number of specimens have already been forwarded, and more are now on the way. To Mr. Goode belongs the credit of having determined in the affirmative the mooted question of whether snakes swallow their young. The collection of snakes made by Mr. Goode is especially complete, comprising almost all the species which have been found in Florida. Various kinds of turtles have also been sent. Altogether, Mr. Goode has procured for the Philadelphia collection 132 specimens, representing 32 species, distributed as follows: Mammals, 5 species; birds, 1; lizards, 4; snakes, 16; turtles, 5; amphibians, 1. Some Florida wild hogs will be shipped, and Mr. Goode is now endeavoring to secure some manatees. A very remarkable ichthyological collection has also been made.

Press. Phila. [illegible]

A RARE FISH—THE TARPUM.

A FISH stall has always had its charms for us, and Mr. Blackford's slab on Saturday last in Fulton Market was particularly attractive. Now you may wander through a fish market, either like one of Mrs. Barbauld's two little boys in the story book who never saw any thing at all, or like the other good little boy (of course he was good) who saw everything. A mass of fish are dumped down on the stand, and if you have a quick eye, if you are the most casual of observers, and even not up itchyologically, you may often discover quite a mine of nondescript wealth. What was in view, however, at Mr. Blackford's did not require peculiar scrutinizing. There extended at full length, full five feet six inches long, was one of the handsomest of fishes we ever saw. He looked as if Tiffany had wanted to make some huge fish out of solid silver, and had burnished a scale here, and there frosted another scale, so that the work perfectly flashed and sparkled in the sun. "Name it," said Mr. Blackford. "Came from Florida?" We said dogmatically. "No, caught off Port Monmouth yesterday." "Sure of that?" we inquired doubtfully. "Certain." "Then we replied oracularly, pray hand us Forest and Stream of June 18th, and you will see that Professor G. Brown Goode, of Middletown University, has precisely descibed that fish, and get a bit of card and write on it TARPUM, or Jew fish, and stick it on the fish and it will save you no end of questions. Now will you be good enough to get us a herring? Not a smoked one." A boy was dispatched to the lower wholesale market and a small sea herring some eight inches long, was soon procured and laid on the big fish. "Now," we commenced, much to the edification of a distinguished audience, a negro boy, a lady boarding house keeper bent on cheap fish, and a market porter, "you will be pleased to observe that your big fish is but an enlarged, a copious edition of this insignificant herring. Just look at those two heads, one scarce an inch and a half in length, the other most a foot and a half long. They bear the most striking family resemblance. Note that protruding under jaw, how it comes up in a lump before, on both the fishes. Fins the same on both, save that just as Professor Goode says, there is a great prolongation of the last spine of the back fin. Little herring has not got it, but the great grandfather of all the *Clupeidæ* has. (Just here looks of astonish-

ment were visible in the audience, and the fairer portion of it retired apparently overcome). This big spine," we continued, "is fourteen inches long. Here you will see that nature too, yearns after uniformity, for we notice, what we have never seen stated before, that the pectorals too have this same spine, though not so large in proportion, as the dorsal one."

Just here the audience all went about their business, and we were enabled to get a closer examination of the fish. Such scales! We took two or three of the largest, which measured two and a quarter by two inches each, each one as beautiful as a shell, and tipped at one side with pure silver. We took his extreme breadth, which was one foot three inches. Down his throat we could have passed our double fist. Asking a fisherman if they were caught frequently, he informed us that he had seen two or three of these fish during his life.

Consulting later Col. De Voe's most excellent book, "The Market Assistant," we saw that the author states "that to his knowledge this very large and scarce fish has been seen but four times before in New York." The measurement coincided to an inch with the fine specimen we saw. Two tarpons Col. De Voe says he saw in 1865, and another in 1857. Referring to Professor Goode's article we notice that he states that "this fish is found occasionally in the waters of the West Indies, and on the east coast of the United States." The tarpum he declares to be *Megalops thrissoides*, and he tells us, as does our other correspondent, S. C. Clarke, Esq., from Smyrna, Fla., (see page 252, May 28) that it is taken in the St. Johns River and brought to Jacksonville. Of course we ate some of him boiled. Now we are constrained to state that generally the handsomer a fish is the better he tastes, and that sometimes the uglier he is (vide squid) the nicer he is. But *Megalops thrissoides*, tarpum, tarpon, or Jew fish, is dry fish, with an exaggerated tastelessness common to the herring. Sweet was it, but flavorless. Optimists as to fish, as far as their edible qualities go, we have no doubt, that converted into a mastodonic Yarmouth bloater, *Megalops* would in small quantity, make a delightful relish for breakfast.

The United States Fish Commission.

The summer campaign of the United States Fish Commission party, under Prof. Baird, Commissioner of Fisheries, has just begun under very favorable auspices. The headquarters for the present season have been established at Noank, New London County, Connecticut, at the mouth of the Mystic river, a thriving little fishing village of some seven hundred inhabitants. Noank is one of the leading depots for iced fish, shipping large quantities weekly to New York, and employing thirty or forty smacks, some in "vending" the extensive pounds at Fisher's and Black Islands and at Napeague on the eastern end of Long Island, others in line fishing on the shoals for sea bass and flounders, others in "scrawling" for halibut. So there will probably be no lack of material for the investigations of the commission. The dredging ground also offers many hopeful indications, Fisher's Island sound appearing to be nearly "the divide" between the northern and southern faunas, and probably hiding beneath its waters the solutions of many important problems in marine physics and zoology. The U. S. Steamer "Bluelight" has been detailed for the use of the party, and during the winter was repaired and refitted with special reference to the needs of the work, so as to be much more convenient than it was last year. Commander L. A. Beardslee of the Washington navy yard is again in command, and his enthusiastic interest in the work contributes much to its success. The "Bluelight" arrived on Friday, the 10th, and made her first dredging trip on the Monday following; she lies at a wharf in the shipyard of Mr. Robert Palmer, a neat little house near by, at the water's edge, serves as a laboratory for the party carrying on the special fishery investigation, while the dredging party is established in a commodious room at the foot of Main street, formerly used as a town hall. The members of the party are quartered at various private houses in the village, as there is no hotel; several have their families with them, the total number connected with the party being thus quite considerable. The *personel* of the party as at present established is as follows:

Prof. S. F. Baird, Smithsonian Inst., Washington, Commissioner; Mr. E. H. Rockwell, Washington, Secretary; Commander L. A. Beardslee, U. S. N., Comd'g "Bluelight"; Prof. Alpheus Hyatt, Custodian, Boston Soc. Nat. Hist.; Prof. A. E. Verrill, Yale College, New Haven; Prof. D. C. Eaton, Yale; Mr. Sidney I. Smith, also of Yale; Prof. William N. Rice, Wesleyan Union, Middletown; Mr. G. Brown Goode, Smithsonian Inst., Washington; Mr. James H. Blake, Mus. of Comp. Zool. Cambridge, Artist; Dr. H. C. Chapman, Philadelphia Acad. Nat. Sciences; Mr. Bean, Wilkesbarre, Pa.; Messrs. Clarke, Turnbull and Brown, Sheffield Scientific School; Messrs. Saltonstall and Rathbon, Boston, Soc. Nat. Hist.; Mr. Carl W. Schurman, Washington; Capt. Ashby, Noank, Conn., Pilot. Capt. H. C. Chester, Noank, Conn.; Capt. William E. Spicer, Noank, Conn.

THE UNITED STATES FISH COMMISSION.

FISH TALES FROM NOANK.

Headquarters, U. S. Fish Com.
Noank, Conn., July 31, 1874.

When at the close of the last season's work, the question of our location for 1874 was mooted it was generally understood that it would be somewhere on the southern coast of New England, and not far from the eastern end of Long Island Sound. Watch Hill, Stonington, Block Island, Sag Harbor and New London were discussed and dropped from the docket, and at last Prof. Baird settled upon Noank. That name Noank has puzzled many a learned head and after long and unavailing research in atlas and railroad guide is for philological reasons usually located somewhere in Maine; it improves however, on acquaintance, especially when we learn that it means "crotched tree" and commemorates an ancient landmark under whose leafy boughs the Pequots used to assemble for council or clam-bake. The monuments of their feasts still remain in the shape of shell-heaps, and our party will no doubt some day celebrate one of the original American festivals by a clam-bake on the spot, giving a flavor to the repast by the study of these ancient *kjoekken-moeddings*. An old grudge of the railroad company is probably the cause of the present obscurity of Noank, an obscurity quite undeserved, for the village is pretty, enterprising and growing. Thirty-five years ago a cargo of iced fish was taken to New York by a Noank smack, the first which ever was brought to the city market, and in the trade thus inaugurated, extensive as it now is, Noank bears an important part. The evening train and Stonington boat take daily shipments and many of the smacks provided with ice-houses carry their fares directly to Fulton market.

Noank has shipyards, too, of no mean importance. At Mr. Robert Palmer's yard where vessels of eight hundred tons are built, the "Dauntless" was remodeled and fitted out for her successful ocean race; at the Mystic yards, a mile up the river, she was built. Here too, not long ago, fifteen gunboats were built for the Spanish government. Here was built the celebrated clipper ship, the "Andrew Jackson," which made the two best voyages from New York to San Francisco, the shortest in eighty-nine days.

The investigations at this station are expected to throw light on many important points in the marine zoology and physics of our coast. In 1871, the first year of the work, the party was located at Wood's Hole on the Vineyard Sound, some 120 miles farther east. During the summer many interesting facts were learned concerning the relations of currents, temperature and depth to the distribution of marine life. Cape Cod has long been known to be a boundary which rather sharply separates two distinct faunas, and which very many species never pass. Three of the faunas recognized by naturalists on the east coast of North America, the Arctic, the Syrtensian including Labrador and Newfoundland, and the Acadian, lie north of it too, the Virginian and Carolinian are south of it. Now while the line of demarcation between the Acadian, which extends nominally from Nova Scotia to Cape Cod, and the Virginian which extends from Cape Cod to Cape Hatteras is much sharper than between any others, yet it is merely an approximate or conventional one, unlike the well known "Wallaces Line" in the Malay Archipelago. A larger part of the species in each fauna crosses the boundary, and many of the deep bays in the vicinity of Wood's Hole were found to contain a great predominance of life belonging to the Acadian fauna, while the shallow bays showed an equal predominance of southern fauna. In the same way the reconnoissances in Maine show that the Virginian fauna has its colonies far north of the boundary; a very long, shallow cove in Casco Bay was found to abound in southern species to the exclusion of others, so that Professor Verrill remarked that it could hardly be distinguished from New Haven Harbor. In the same way small southern colonies were found on the Bay of Fundy and in the Gulf of St. Lawrence. A thorough investigation of these questions is important and it was supposed that a point more distant from Cape Cod would yield many new facts. The rocky reef at Watch Hill seems to be a boundary of minor importance, and our station was chosen partly on account of its proximity thereto. At first blush it may appear to some that such inquiries, however important in themselves, are not properly within the scope of a commissioner appointed "to prosecute investigations with the view of ascertaining whether any and what diminution in the number of the food-fishes of the coast and the lakes of the United States has taken place, and if so, to what causes the same is due, and also whether any and what protective, prohibitory or precautionary measures should be adopted in the premises," but a moment's thought will convince them that the requirements of the law cannot be carried out by anything less than a complete zoological, botanical and physical survey of North American waters. So intricate and intimate are the relations of the fishes to every form of life with which they are associated, and to the depth, temperature and pressure of the element in which they live, that every fact ascertainable is necessary to an intelligent understanding of the numerical diminution of any species, its cause and its proper remedy. Even if a given form is not destructive to another or beneficial to it as food or otherwise, it holds some such relations to other forms which are, and we may find under the waters many parallels of Darwin's example in which he shows the intimate dependence of bumble-bees upon old maids through the medium of cats, field-mice and clover fields. Then too, the complete survey of the field can be made at an expense and trouble little greater than the investigation of points which might seem of particular importance.

The SPORTSMAN of July 21 gave some account of the opening of the work which is now going rapidly forward.

A systematic exploration of the bays and sounds has been commenced with the aid of pond nets, seins, trawl pots, gill nets and fyke nets; the aid of most of the Noank and New London smacks has been secured and scarcely a day passes without interesting additions to the collections. All specimens are carefully studied with reference to habits, food, time, place and manner of breeding, external and internal parasites, mode of capture economic value relations of size and weight, etc.

Sixty–one species of fishes have been observed, two probably new to the fauna. Among the notable captures have been three Drum-fishes (*Pogonias chromis*) the largest weighing over one hundred pounds, and three specimens of the Lump Sucker (*Liparis lineatus*) taken to-day for the first time south of Cape Cod; others are the Orange File-fish (*Ceratacanthus aurantiacus*), the Hammerhead Shark (*Sphyrnazygœna*), the Broad-winged Sea Robin (*Prionotus lineatus*) and the Box-fish (*Chilomyeterus geometricus*). A large Dusky Shark (*Eulamia obscura*) was roasted for flavor, being served up as "white sturgeon" but was voted rather tasteless and tough, a similar verdict condemning the Sea Raven (*Hemitripterus acadianus*).

Many species are now breeding and experiments in artificial propagation of some of them are being made. Several thousand eggs of the Sea Bass (*Centropristes atrarius*) were fertilized and are now, on the evening of the third day, in promising condition. An interesting experiment has been tried by Prof. Baird, to ascertain the effect of sea water upon young shad. On the 23d ult. Mr. Fred Mather arrived with 20,000 young fish from the Holyoke hatching establishment, a portion were immediately transferred to hatching boxes in the salt water where they died in a few hours, as did others placed in a shaded tub of salt water; others still were kept in strongly brackish water, where they lived from thirty to forty hours; some kept in brackish water a few hours and then transferred to fresh water lived about eighty hours. Could the fish have had Mr. Mather's personal care for a longer time they would no doubt have lived longer lives, for the water in the cars was changed only three or four times a day, and partially at that. The experiment is quite satisfactory, however, showing; (1) That a sudden change from fresh to salt water is impracticable. (2) That they can be kept for some days in water which is very brackish. I apprehend little difficulty in accustoming them to salt water by gradual and careful addition of salt water to the fresh. The experiment has an important bearing on Prof. Baird's proposed transatlantic shipment of young shad.

The "Bluelight" has been busily employed by the dredging party under charge of Prof. Verrill. Over four hundred species of invertebrates have been noticed, some forty of them new to the fauna. To-day in dredging off Watch Hill we struck a spot where, at eighteen fathoms depth, the temperature was 57 degrees and the bag came up full of northern forms, just such a haul as we might have had in Casco Bay.

The trawl was lowered and brought up at least fifteen hundred pounds of scrapings, requiring the whole force to lift it over the rail. Among other things were ninety-seven Clear-nosed Skates, twenty-one flat fishes, two spotted turbots, two four spotted flounders, one hake, three lump suckers, one cunner, ten skates eggs, and approximately three bushels of sponges scollops and sea urchins.

Captain Beardslee is making a series of experiments with the Miller Casella thermometers which have already produced results of much importance.

Our party continues to increase; Prof. Joseph Leidy of Philadelphia and Dr. M. P. Hatfield of Chicago have recently arrived and Prof. Harrison Allen of Philadelphia and Dr. W. G. Farlow of Cambridge have visited us during the past week.

FRATER AQUARIUS.

Aug 9

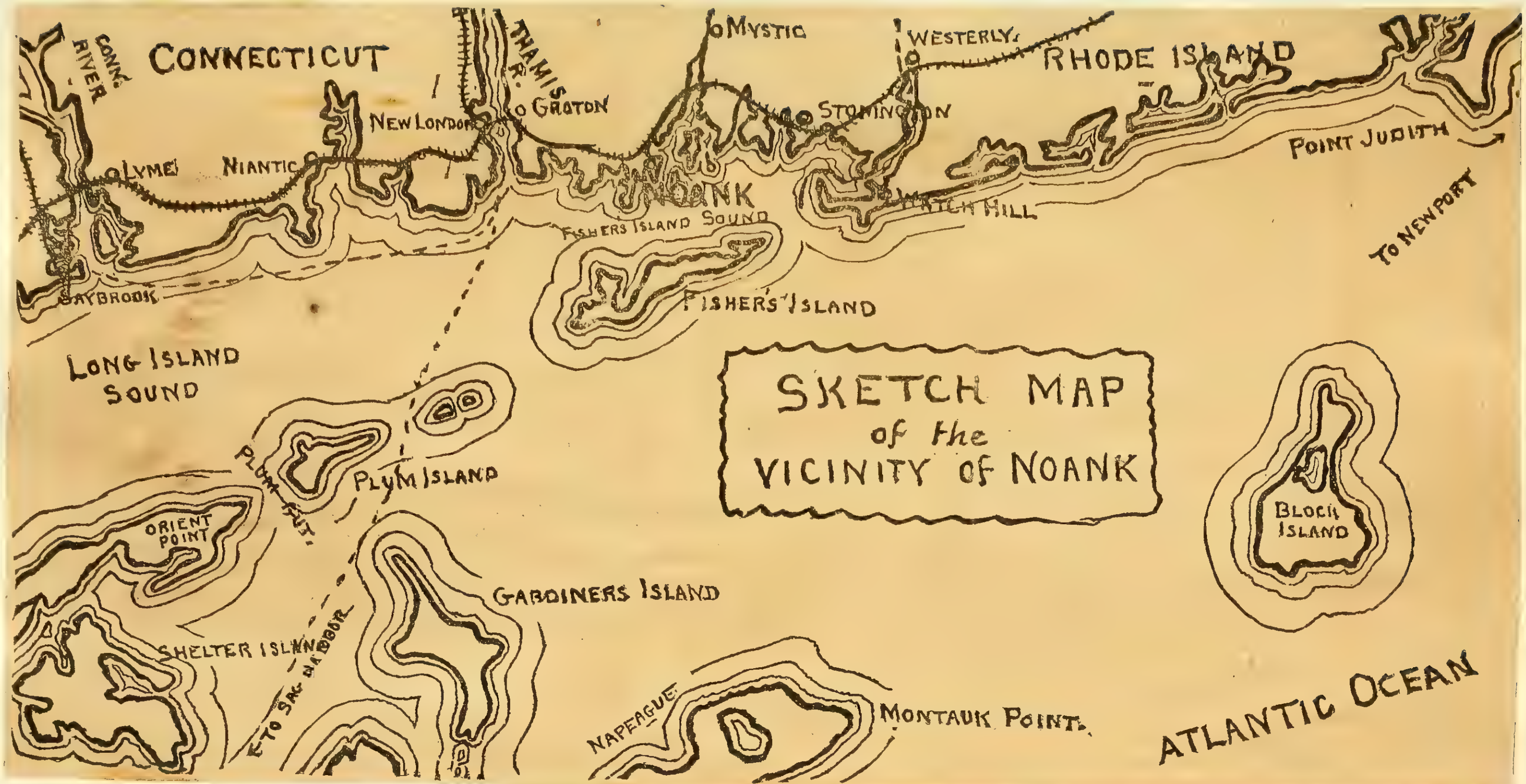
The United States Commission of Fish and Fisheries.

DREDGING ON THE COAST OF CONNECTICUT.

As the work of Prof. Baird in his sea-coast investigations is becoming better known its importance is more and more appreciated; the party is this year larger than ever before including twenty actual workers, many of them the highest authorities in their specialties; counting the families of members, seamen and other employees the party at Noank numbers seventy and is still growing. This year for the first time, it has been practicable to divide the party into two sections, one making physical observations, dredging and investigating the history of the lower forms, the other undertaking the study of the fishes, their habits and the statistics of the fisheries.

The facilities have never before been so good; until last year the work was mostly done on sail boats with occasional aid from the revenue cutter on the nearest station. In 1871 a steam launch from the Boston Navy Yard was secured for part of the season. In 1873, the Secretary of theNavy placed at the disposal of the Commissioner the steamer "Bluelight" which has since been kept under his orders and has been fitted out especially for his needs; by this aid the amount of the season's work is at least quadrupled; for the dredging party, independent of wind and tide, can easily make a trip of forty miles, do their work and return the same day. The explorations of St. George's Banks on the coast survey steamer "Bache" are to be continued during the summer.

"The "Bluelight" is a trim little tug-built steamer of eighty.five tons used during the war as a powder boat, and is very strong and sufficiently fast. The most important part of her new outfit is a donkey engine of considerable power by whose aid the heavy instruments are handled, a strong iron davit keeping them clear of the side. The engine stands on the forward deck which is shaded by an awning and on which all the work is done; tables are in readiness to be used in assorting the specimens, while near at hand is a little cabin fitted with shelves and racks for bottles, buckets and physical apparatus; this same cabin is fitted with three or four berths the use of which is very apparent on the first trip of those who have not acquired their "sea-legs." The main cabin is on the same deck and is more commodious than in many first-class men of war; here twenty persons can easily dine, and since dinner must often be taken on board, this is very convenient. On the hurricane deck is storage room for the large trawls and dredges and for the "balsa" or life-raft. On the same deck in front of and around the pilot house is a small balcony from which visitors may watch the busy crowd on the deck below, sure of being out of the way. In the hold may be stored cables and other extras, while a large ice-house preserves the perishable specimens too large to be bottled at once. In short, the "Bluelight" is a model in its way. The "Challenger" now carrying the British deep sea exploring party on its three years cruise, is of course much larger, being


SKETCH MAP
of the
VICINITY OF NOANK
CONNECTICUT
CONN. RIVER
THAMIS R.
O MYSTIC
WESTERLY
RHODE ISLAND
NEW LONDON
O GROTON
STONINGTON
O LYME
NIANTIC
NOANK
WATCH HILL
POINT JUDITH
TO NEWPORT
SAYBROOK
FISHERS ISLAND SOUND
FISHERS' ISLAND
LONG ISLAND SOUND
PLUM ISLAND
PLUM GUT
ORIENT POINT
GARDINERS ISLAND
SHELTER ISLAND
TO SAG HARBOR
BLOCK ISLAND
NAPEAGUE
MONTAUK POINT
ATLANTIC OCEAN

provided with working laboratories with libraries, microscope tables, alcohol, tanks, lockers for specimens and everything necessary for the study and preservation of material on board, but the exigencies of a survey like ours are better met by a laboratory on land, supplemented as it is by the laboratories and libraries of the Smithsonian Institution, Yale College and other scientific institutions.

Every morning after breakfast preparations for the day's work begin. Thick boots of leather or rubber, blue flannel shirts and broad brimmed hats are prominent features in the make-up of the party. These are considered "first rate chances to wear out all ones old clothes," and when, at the sound of the "Bluelight's" whistle, the motley procession starts for the wharf, each member staggering under his load of buckets, bottles and dip-nets, it would hardly be supposed by a casual observer, that in its ranks are several of the leading scientific writers and lecturers of the land, professors in our chief literary scientific and medical colleges. Here is none of that fastidiousness sometimes seen among naturalists, especially those of the *dilettanti* order, but each man is ready to take his pull at a rope, and eager to plunge up to his elbows into the muddy contents of the dredge. Their labor has other than scientific results, for they return in the fall to their studies with faces and arms bronzed, chests expanded and limbs elastic, with clear eyes and clear brains, their blood almost effervescing under the spell of cool, bracing sea air, twice the men they would otherwise be.

All are on board, the lines are cast off, we back from our berth into the channel, we hear the four bells for "ahead fast" and with a brisk, merry "ching-chug chug-chug chug-chu" we steam along past the long wharves, margined with smacks, past the busy shipyards, past "The Cedars" where some of the ladies of the party are waving a farewell salute, down by the point and Mystic Light and stand out through Fisher's Island Sound. An hour brings us to some promising locality designated on the chart perhaps by the symbols "18, s. br. sh." which being interpreted mean, "depth eighteen fathoms, bottom sand with broken shells." "Stand by to take a sounding!" is the order, and the moment the vessel's way is sufficiently stopped the old quartermaster has had his lead on the bottom, the tallowed cup is carefully inspected and the answer comes "eight'n an' a ahf fethums, sur, an' a zandy bot'm." The spot is carefully located on the chart, and "over dredge!" is the signal for the instrument to be dropped over the side, swung off and lowered by a slow, reversed movement of the donkey. Meantime one of the party has lowered a Miller-Casella thermometer on the sounding line and stands watch in hand, until it has gained the equanimity to tell the true temperature of the bottom, after which he takes surface temperature and records the figures in a book, together with notes on time of day, time of tide, state of sky, temperature of air, depth nature of bottom and direction of currents. The water-bottle, a long brass cylinder with valves, is used to dip up some of the bottom water which is carefully preserved for the determination of specific gravity and the percentages of salt and air. One man stands with hand on dredge rope, for a naturalist feels as keen a delight in the steady tremulous motion of the dredge scraping over a good bottom, as does the angler in the tug of the salmon at his slender line; his thoughtful brow shows that he is estimating the number of rare *ophiurans* or *pectens* it will soon bring to light; all at once there is a jerk, the safety check-stop snaps asunder, the alert seamen cast loose the line, Mr. Cook pulls the bell and we are steaming towards the dredge, which has caught on a rock; two whistles, "up dredge!" "up dredge!" echoes the quartermaster and then the donkey snorts and puffs and scatters steam spray and the dredge-line is reeled up, while the seamen coil away the slack. Soon the iron arms and gaping jaws of the dredge come to the surface while all stand on and over the rail, eager for a first glance at the mysterious treasure within the canvas; the davit is swung around, a mass of broken shells and sand is dumped into a large cradle-sieve which hangs over the side; a long hose appears at the engine room door, unrolls as it comes forward and soon a heavy stream of water is playing into the sieve, sweeping out the sand and mud and uncovering countless treasures of animal life. The sieve is now hidden from sight by a knot of heads from which issue exclamations of surprise and delight. Now it is a superb specimen of the beautiful little coral, *Astrangia Danae*, the most northern of its kind, now it is the sight of the northern and southern sea-urchins, *Arbacia punctulata* and *Strongylocentrotus Droebachiensis* both in the same haul, now it is a half-bushel, or more of a bright yellow sponge, *Cliona sulphurea*, which one of the party seems to think would set him up for life, "if he could only keep them alive;" one of the party is in ecstacy over a little spray of crimson sea-weed *Ptilota serrata*, "the first time it ever was seen south of Cape Cod," though we used to dredge it by the bag-full on the coast of Maine; another rushes off with one of those curious little black objects known as "mermaids' purses," or "devil's knitting sheaths," and with a pair of scissors, liberates, from his ovine prison, a lively little skate, *Raia eglanteria*, an inch in length. And so it goes on; sometimes one hundred and thirty species are brought up in a single haul. The living animals are placed in buckets of water, to be studied on our return, then a large table is fitted across the deck, a tarpaulin table-cloth is spread, the remainder of the haul is thrown upon it, and all gather around with a promptness which reminds one of the city newsboys at their annual Thanksgiving dinner. One member, with pencil and note book, takes a catalogue of the species captured; the others, with forceps and fingers, soon transfer the specimens to their bottles and pails. Even the sea men catch the fever, and wander anxiously about with some poor crushed creature in their fists, inquiring "is this a specimen?"

Sandy bottom is good for trawling; the trawl net has been lowered and is dragging the ocean floor, while the ship slowly backs along. Dinner is announced and all soon meet in the cabin. A good chowder, "a la Bluelight," is *always* the first course, and the party do full justice to the *menu*, even unto the coffee Notes are compared on the days' work; the captain spices the conversation with a story of adventure in China Seas or Indian Ocean, and the picture is complete if some poor neophyte finds the rolling uncomfortable, and steps out "to see how the trawl is dragging."

Dinner is over, and the trawl is pulled in: sometimes it is empty, sometimes it brings such a weighty load that the whole force with pulleys and boat hooks can hardly raise it over the rail. Once it brought up, from seventy fathoms a huge granite boulder, three feet thick, and weighing half a ton; once it brought a barrel of sea-cucumbers, *Pentacta frondosa*; once two barrels and more of lobsters, and the last time it was used it caught two hundred full-grown skates *Raia eglanteria*, to say nothing of other fishes, sponges, and *pectens*. The trawl takes only large things which are soon disposed of, and the dredge is put over again; and if it is rocky the "tangles" are allowed to drag The "tangles" are simply great mops of spun-yarn attached to an iron bar to be dragged over the bottom: the fibres of the mops entangle star-fishes, crabs and sea-weeds, and I have seen seven or eight thousand star-fishes brought up at once. It has been proposed to use this machine in freeing oyster beds from these their deadly enemies. A few hauls of the dredge will gather more material than can be taken care of before midnight. and by supper-time our ship is snugly made fast to Palmer's wharf.

Prof. Putnam American Naturlist, Dr. Holder American Museum of Natural History, Mr. Wyckoff of the Tribune, Dr. Edmonds, Commissioner of Fisheries, Vt. Col. Lane, New Haven, and Commissary General Eaton, are among the weeks visitors.

The United States Commission of Fish and Fisheries.

NOANK.

THE "LABORATORY."

My last letter described a dredging trip in Block Island Sound. and came to a close with the arrival of the "Bluelight" in Noank harbor. The field work, if we may so call it, of the day being over, a task quite as important remains, the assorting and study of the material collected. Let us take a glance at the headquarters of the dredging party. A large room, in dimensions some sixty feet by thirty, occupying the second story of a large building at the foot of Main street and accessible by a flight of outside stairs, has been transformed from a sail-maker's loft to a working laboratory; once this was the public hall of Noank and its walls still bear a reminiscence of former fair or festival in the staring, green letters of a "WELCOME." To the naturalist it is now a veritable palace, a storehouse of treasures more precious than Aladdin's lamp ever brought into his youthful visions. In front of each window is a tier of tables, between the windows are rows of shelves, filled with jars, bottles, phials, boxes, microscope cases, and books, suggesting to one irreverent mind "a drug store with a literary turn." In one corner is a stock of oars, dip nets, hoes, shovels and picks, grappling irons, towing nets, and the other appliances for exploring the bays and the shores at low tide. In another corner, amidst a wilderness of old coats and tall boots, we catch a glimpse of a fragmentary looking-glass, a sort of rudimentary organ to the party, a connecting link between the informalities of the summer and the restraints of home life.

A large table in the middle of the room has on it buckets and earthern dishes in which the animals are kept alive by constant renewals of fresh sea-water. For the study of the smaller animals a white dish filled with water is more convenient than a large aquarium, for the species can thus be kept separate, and the specimens are always conspicuously visible for examination or drawing. An aquarium stands near, ready to receive any large specimens which need to be preserved for a longer time.

A flight of steps leads up to the cock-loft, where the visitor beholds an army of lobsters, star-fishes, sea urchins, crabs, sponges and sea weeds, spread upon the floor to dry.

The tables are occupied by busy workers, one at his microscope, another with his note book, others picking over plates full of dredgings, searching the mud and broken shells for minute forms which had not been picked out in the first culling on board of the steamer; others are transferring the identified specimens to their houses of glass where surrounded by an atmosphere of alcohol, they are to remain until needed for farther study.

At one of the tables sits a learned professor, well known at home and abroad by his studies of fossil cephalopods and his theory of the "Origin of Genera." Sponges of many and beautiful forms fill his bottles and his bowls of sea water. He is studying, too, the lower mollusks, the *Bryozoa* and the *Tunicata*. Perhaps he will allow you a peep through his microscope at a curious object which looks like a little "tadpole." Thereby hangs a tale as well as a tail, for this little creature is causing a commotion in scientific circles just now. It is the early or larval stage of one of the "sea peaches," *Cynthia carnea*, and though one of the lowest of the mollusca, has been declared by a Russian naturalist, M. Kowalewsky, to show in its tail traces of a segmentation resembling that of the notochord, or embryonic back bone of vertebrated animals in their early stages. Yet we wait for more proof before we yield to our feelings, and refrain from shedding our tears over the possible ancestor of the human race, whose existence is suggested to us by this strange little creature.

At the next table we find an eminent anatomist from Philadelphia, engaged in the study of the Rhizopoda or root-footed animalcules, a group of microscopic animals of which the *Amœba* is perhaps the best known example; little filmy patches of mucus, they appear, but when highly magnified many of them are of exquisite beauty, with delicately and elaborately sculptured shells, from which they protrude their "root-feet" (*Pseudo—podia*) in graceful movements. Some of them are not larger in diameter than 1-2800th of an inch and the largest are barely visible to the unaided eye. The Professor has already identified them in most of the forms known in Europe, and has in preparation an elaborate monograph of the group.

At this window too, is the artist of the expedition, Mr. Blake, whose quick pencil preserves the outlines of the animals as they lie under his microscope or in his watch crystal. It is the intention of Prof. Verrill to figure in his report to the Commissioners, every invertebrate species on the coast which has not been well figured before.

Another table is devoted to crabs and upon it and its predecessors, during the three years past, has been done some of the prettiest and most valuable of the work of the party. To its occupant science is indebted for an account of the development of the lobster (*Homarus americanus*) from the egg to the adult. Just now he is studying the early stages of some of the crabs, and his dishes are filled with egg loaded parents which he watches with ceaseless care from morning till night. A curious sight is a dish full of the new born young (*Zoeæ*) a whirlwind of little creatures, with enormous compound eyes and long nose-like rostra.

A fifth table is at present devoted to the Acalephs or "jelly-fishes." You are shown specimens, put up in bottles of picric and osmic acid, which are very satisfactory, when it is remembered that of all things, a jelly-fish is the most difficult to preserve, on account of the large proportion of water in its tissues. Yet they seem like poor, discolored caricatures when you see the contents of a wooden bucket under the table which is filled with living specimens of *Idyia roseola*; this is to my notion the loveliest creature on our coast, shaped much like a hen's egg, as transparent as clear glass though with a rosy tinge, its outlines barely distinguishable as it floats just below the surface; its sides spanned with eight living rainbows whose prismatic changes are indescribably beautiful.

Another bucket has some specimens of the beautiful *Staurophora* or "cross-bearer" a broad, limpid disk, displaying a white Greek cross which at a distance seems floating unsupported in the water. A group at another table are mounting sea-mosses, dexterously transferring them to paper with their branches as gracefully extended as when afloat in their native element. Prof. Verrill is the presiding genius of the place, each specimen passes under his eye, and the unique ones are taken to his desk, where midnight always finds him absorbed in his researches, forgetful of hard days work just past and the new one just beginning. The studies made here are only preliminary, the final work being done in the Professor's own laboratory at New Haven, with the aid of the extensive suites of specimens collected in former years.

FRATER AQUARIUS

[illegible]
Aug 22 [illegible]

THE ORANGE FILE-FISH.

CERATACANTHUS AURANTIACUS, (*Mitchill*) *Gill.*

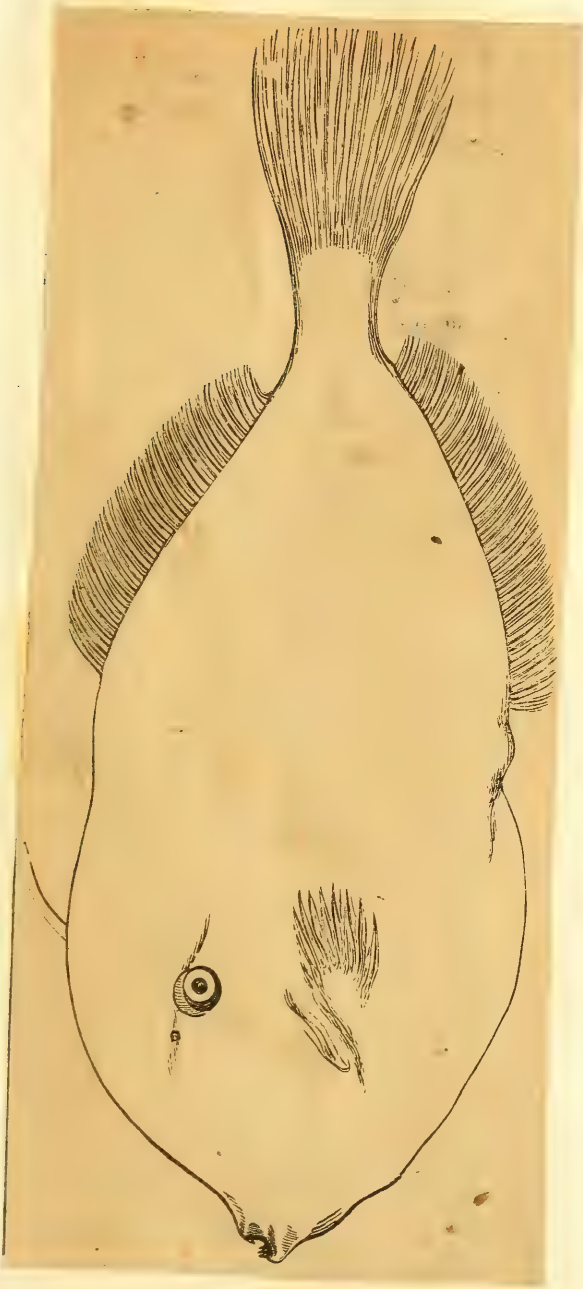
H'DQ'RS U. S. COM. OF FISH AND FISHERIES,
NOANK, Conn., Aug. 24, 1874.

The following item was clipped from the New London *Telegram* of the 25th ult.:

"The fish-laden smack 'Fashion,' which arrived here to-day from Montauk, included in its cargo an inhabitant of the briny deep, the like of which the fishermen say they never saw or heard of before. This new fish weighs from two to three pounds, has very large eyes, a mouth like that of a monkey, is variegated in color—white and blue predominating,—and in shape resembles the flat-fish. The 'Fashion' is at Bolles & Benhams' wharf, and has been visited by quite a number of people whose curiosity was excited by stories of the new comer."

Of course this story excited the curiosity of the party at Noank, for, unlike most newspaper announcements of this character, the paragraph did not bear on its face the marks of a *canard.* Visiting New London we soon found our way to the fish market—a place to which the instincts of a naturalist lead him almost the instant he reaches a seaport town. There, lazily disporting themselves in an open bass car near the wharf, we were shown the strangers, which were, as Professor Baird had predicted, orange file-fishes. I had never before seen the species alive, and for an hour or more stood watching their strange movements. The largest was eighteen inches in length and five in height, yet so thin that it weighed only two pounds. The reporter was not far from right in saying that its shape was like that of a flat-fish; in fact a rough idea of its appearance may be gained by imagining a flounder having symmetrical sides and swimming in an upright position.

The most noticeable feature about the fish is its mouth, and this is still more striking if the skin and flesh are removed and we get a good view of the skeleton. The bones of the upper jaw are closely united and in the lower are completely grown together, instead of being separate as they are in most fishes. This gives the jaws an extremely powerful grip, their action being much like that of a pair of nut-crackers, and they are set with rows of teeth which, though thin, are very sharp and strong. Thus provided the fish browses with ease among the rocks upon its pasturage of barnacles, snails and mussels. A similar union of the bones of the mouth is found in the sun-fishes, box-fishes, swell-fishes, porcupine fishes and trunk-fishes, as well as in the file-fishes, and has given the name to the Order in which they are all included—that of the *Plectognathi* (*plectos*, conjoined, and *gnathoi*, the jaws). If the hand is drawn along the side of the fish it feels a surface like that of coarse sand-paper, and if we examine the scales, which, instead of overlapping each other as in ordinary fishes, are minute and placed side by side like those of a shark, we find that each is provided with a rough protuberance or knob. The fishes thus roughly clad are known as "file-fishes" and constitute the Sub-order *Scleroderma* (*skleros*, rough, and *derma*, skin). The carpenters in the West Indies often use their skins for polishing wood-work. In front of the dorsal fin we notice a strong, rough spine, about two and one-half inches long, resembling the trigger of a gun. It is arranged to fold into a groove in the top of the back, like a jack-knife blade into its handle, so that it shall offer no resistance when the fish is swimming through the water. A peculiar knack must be used, however, in shutting it down, for it is like a gun-trigger in the mechanism of its hinge as well as in its appearance. At its base the spine is expanded and divides into two arms, the extremities of which approach each other and embrace the crest of the super-occipital bone, which has upon each side a depression to receive the terminal knobs; a long, curved spur, which describes the arc of one-third of a circle, projects backward from the spine, at a point just above the junction of its basal arms, and is received into a curved mortice which extends forward under the super-occipital crest, thus clamping the spine down upon its seat and forming a hinge which allows



free movement forward and backward but no sideswaying. Close behind the spine is another powerful saddle-hinge, surmounted by the merest rudiment of a spine which constitutes the "catch" of the trigger. When it is bent forward, as it may be at the will of the fish, its extremity is received into a hollow near the base of the trigger, which is thus set, at an angle of forty or fifty degrees, as immovably as the trigger of a Parker "rebounder" at half-cock; by pushing back the catch, the spine is released and may easily be pressed back into its sheath. This mechanism of the dorsal spines, so curious and (if I may so speak of what is not of human contrivance) so ingenious, is varied in the different genera of the family and has given to it the name *Balistidæ*. Some of the forms have several spines in the back-fin, but this has only one, and is therefore classed with the "unicorn fishes," or the sub-family *Monacanthinæ* (*monos*, single, and *acantha*, a spine). Professor Gill has made for this fish a special genus which he calls *Ceratacanthus* (*keras*, a horn, and *acantha*, a spine). Its color is like that of a fresh Messina orange, marbled with white and dark brown. The throat and cheeks, up to and in front of the eyes, are whitish, with a beautiful opalescence in which blue predominates. The prevailing color gives the fish its specific name and completes the title of *Ceratacanthus aurantiacus*, the "orange file-fish," or, better still, the "orange unicorn-fish."

Our friend, Mr. A. Ceratacanthus, was first introduced to the scientific world by a gentleman to whom it owes other favors, many and great, Mr. Robert Fulton, who caught the first specimen in New York harbor, August 1, 1814. It had for god-father Samuel L. Mitchill, M. D., Professor of Natural History in the University of New York, Representative in Congress, &c., and was first noticed in a paper entitled "The Fishes of New York, Described and Arranged," read before the "Literary and Philosophical Society of New York" on the 8th of December, 1814. Brought to notice by the inventor of the steamship, christened by the father of American ichthyology, under the auspices of a learned society whose successor New York cannot at this day show, its record is certainly a creditable one. Its connections, too, are extensive, for no less than forty of the common fishes of the east coast of North America claim Professor Mitchill as sponsor and bear his name as authority for their own. To be sure, his descriptions are but little better than none at all, yet allowance must be made for the difficulties encountered in a field of research then quite unexplored. I watched the fishes lazily swimming among the sea-bass. Perhaps if Robert Fulton had spent an hour or two in studying the motions of his file-fishes' fins he might have grasped the idea of propelling a boat by a screw under its stern, and saved steam navigation from the long developmental pe-

(CONCLUDED ON PAGE 356.)

(CONTINUED FROM PAGE 353).

riod of side-wheelers. At any rate, he might have found a worse model for a propeller than the file-fish would have been.

I will try to describe its motions as they appeared to me. As in all the fishes of this order which I have observed, the propelling power is exercised chiefly by the dorsal and anal fins, the tail, that powerful sculling oar so important to other fishes, being degraded to the rank and function of a rudder. Occasionally, when disturbed, the fish gave a rapid side sweep of its tail, yet seemed to depend chiefly on the undulating, Archimedean screw motion of the back-fin and its counterpart the anal, though perhaps the caudal would be made use of in a long rapid journey. Like the rest of the family, the fish appears to be sluggish and sun-loving in its habits, passing the day lazily floating or flapping its broad sides at the surface. A horizontal position was often taken, a sudden and oblique twist of the tail-rudder serving to throw the fish upon its side, in which attitude it would remain slowly propelling itself by a motion of the dorsal and anal, which must be seen to be understood, which I cannot describe, though I have seen it also in the flounder. A slight movement of the pectoral fins, situated as they are below and in advance of the centre of gravity, changes the delicate poise of the fish and lowers its head, an oblique motion with the upper edges of the fins turned inward has the contrary effect. Sometimes the fish would assume a strange position, its body upright, head downward, then by a reversed motion of the pectorals it would "back water" until it had raised its tail above the surface as far as the base of its rays ; in this attitude it would remain for a short time, wagging its tail with apparent enjoyment. Whether this act indicates pleasure, as in a dog, or anger, as in a cat, I was not able to learn. But the tail seemed such a convenient handle that the temptation to take hold of it was almost irresistible. When swimming near the surface it would often turn upon its side with a sudden sweep of its tail, and glide along just at the surface, resuming its first attitude as soon as its momentum was gone. Dr. Storer speaks of one taken in the harbor of Portland, Me., which "appeared, when about a fathom under water, like a bit of kelp, and was rising toward the surface, when a fisherman, observing its motion, put his hand into the water, and the fish came directly into it and was caught."

Though the family to which the orange file-fish belongs is a tropical one, this species appears to be confined to the eastern coast of the United States, ranging from Maine to Georgia. Professor Baird took several at Wood's Hole, in 1871, and a number were taken, last year, in the pound at Fisher's Island. The Noank fishermen call it the "cow-fish," but in New London it was so great a novelty as to be without a name, and the market men, fisherman fashion, coined for it a new one, which was ingenious if not appropriate—the "shiny night-cap fish." Captain Bolles presented one of the fishes to Professor Baird and its skeleton makes one more in the Bluebeard closet of the Commission.

FRATER AQUARIUS.

Am. Sportsman
[illegible] 355.
Sept [illegible]

UNITED STATES COMMISSION OF FISH AND FISHERIES.

THE EXPERIMENTS WITH YOUNG SHAD.

HEADQUARTERS U. S. COM. FISH
AND FISHERIES.
NOANK, Conn., Aug. 26.

Having in my two previous letters given some account of the operations of the dredging party, I now propose to perform a like duty by the party engaged in the fishery investigation. This week I send an account of some interesting and important experiments on the effects of transferring newly-hatched shad from fresh to sea water; no mention has hitherto been made of this investigation as I preferred to wait until the work was completed before attempting to sum up its results. Mr. Milner in whose hands the management of the investigation had been placed by Professor Baird, was unfortunately called away soon after the experiments were inaugurated; his plans have however, been very efficiently carried out by his assistant Mr. C. D. Griswold, of South Hadley Falls, Mass., with the aid of Mr. John Vealey. From the time of their leaving the egg, the young fish have not been left for an instant, some one being always near to regulate the temperature and light or to furnish the needed supply of fresh water.

I am indebted to Mr. Griswold for the following notes, which by their minute detail, show the care which has been used; as has been stated before, the scheme of work was arranged by Mr. James W. Milner, Deputy Commissioner of Fisheries.

At 5 a. m. on the 15th inst., 45,000 shad, just out of the eggs, were taken from the hatching boxes at Holyoke, Mass., and placed in five forty-quart tin cans for transportation.

Noank was reached at 11:30 the same morning; during the transit and for ten hours after their arrival, the fish were supplied with fresh spring water every two hours; one-eighth of the total amount of water in the cans being drawn off and replaced by new. At 9 p. m. the experiment was inaugurated, the fish being placed in ten four gallon stone jars—about four thousand in each. The jars were filled with fresh spring water which was to be gradually replaced by sea water until a complete change was made. Four schemes were simultaneously begun, the details of which will be given in proper order; in these it was the aim to keep the temperature uniform with that of the water in the bay. It should be stated that the water in the jars, after the completion of the schemes of change, cannot have been pure salt water, but yet so nearly approximated it that there was probably no appreciable difference. The water was changed every third hour, two quarts or one-eighth of the old water being drawn off by a rubber siphon, and replaced by a new supply with which salt water was added in a regular ratio ot arithmetical progression which varied in the different schemes. The fresh water was brought from a spring half a mile distant, and this as well as the salt water, had the advantage of being dipped up, not drawn through a slimy pump. The utmost care was taken to preserve the cleanliness of the jars.

Scheme I.—(Jar No. 1): To change the water from fresh spring water to sea water in 45 hours; adding one gill of sea water at each change. Thus at twelve, midnight, two quarts of the old water was withdrawn and replaced by a mixture of fifteen gills of spring water and one of sea water; at 3 a. m., fourteen gills of spring water and two of sea water, and so on. This scheme was completed on the 17th, at 6 p. m. The temperature of the water ranged from 69° to 71°. On the 18th at 9 a. m. the young shad showed signs of weakness, and at 6 p. m. were all apparently dead, 85 hours after leaving the hatching boxes, and 24 hours after the water had become entirely salt.

Some were taken at the last moment from the bottom of the jar, where they had fallen, and placed in a two quart glass jar (Jar No. 11), filled with a mixture of half salt and half spring water; here they revived, and lived until 6 p. m. on the 22d, an additional period of 96 hours, making a total of 181 hours.

Scheme II.—(Jar No. 2): To change from spring water to sea water in 90 hours, adding one-half a gill of sea water at each change. This scheme was completed on the 19th, at 3 p, m. The temperature ranged from 66° to 70°, except on the 20th, when at 6 p. m. it reached 78°, that of the air being 79°; this no doubt, hastened the death of the young shad which showed signs of weakness on the 19th. at 9 p. m., gradually dying from that time until 9 a. m. on the 22d. when all were gone, 172 hours after leaving the hatching boxes, and 66 hours after the water had become entirely salt.

Scheme III.—(Jar No. 3): To change the water in 36 hours from spring water to a mixture of one-third sea water and two-thirds fresh water; adding one-half a gill of sea water at every change. This scheme was completed on the 17th, at 9 a. m. The temperature ranged from 66° to 68° on the 20th and 23d rising with the air as high as 75°, and this excessive heat caused considerable mortality. On the 23d at 6 p. m. they showed signs of debility, yet on the 24th at 3 p. m. fully one-eighth were alive, and some survived until 7 p. m. on the 25th 252 hours after leaving the hatching boxes and 174 hours after their water had been changed to the required proportions.

Scheme IV.—(Jar No. 4): To change the water in 45 hours to a mixture of spring and sea water in equal parts; adding one-half a gill of sea water every three hours. This scheme was completed on the 17th, at 6 p. m. The fish in this jar seemed exceptionally sprightly until they began to settle on the bottom at 9 a. m. on the 22d; all were dead at 3 a. m. on the 23d, 190 hours after leaving the hatching boxes and 129 hours after their water was brought to its required proportions.

Scheme V.—(Jar No. 12): To change the fishes directly from spring water to sea water. This experiment was repeated three times, the fishes dying in from two to three hours.

Scheme VI.—[Jar No. 13]: To keep the fish in water dipped from the surface after a heavy rain. The water was very brackish, and its temperature ranged from 69° to 72°. The fish lived from 8 a. m. on the 16th to 12 m., on the 21st, 124 hours.

Scheme VII.—[Jar No. 14]: To change from Jar No. 14 to fresh spring water. This change was effected at 5 p. m. on the 22d, and the fish survived until 9 p. m. on the 23d.

Scheme VIII (Jar. No. 15): to keep the young fish in water taken from a fresh water pond. Water for this purpose was taken from a pond of clear water from which the villagers obtain their yearly supply of ice. The fish survived the change 24 hours.

Scheme IX. (Jar. No. 5): A temperature test, the jar being filled with spring water, kept constantly at a temperature of 65 deg., by the addition of ice water. The fish lived until 3 a. m., on the 23d. 190 hours from the hatching boxes.

Scheme X (Jar No. 6): Temperature test at 60 deg., and Scheme XI (Jar No 7), temperature test at 55 deg. It was found impracticable to keep the temperature at these points, and the average in Nos. 6 and 7 was not below 64 deg. In jar No. 6 the fish survived until 9 a. m., on the 23d, 196 hours. Jar No. 7 seems to have on the whole, been the most successful, the greater part of the fish surviving until 9 p. m.. on the 23d, when they died, all at once, after 208 hours of life.

Scheme XII (Jar No. 8): Temperature test at 50 deg. On the 21st this jar was placed in the refrigerator, where a temperature of 48 deg. for the bottom and 52 deg. for the surface was attained, giving an average of 50 deg. The young fish died in the course of seven hours.

Scheme XIII (Jars Nos. 9 and 10): Temperature best at 70 deg. This temperature was successfully maintained, The young fish died at 3 p. m. on the 23d after living 202 hours.

It will be observed that in some respects the best results were obtained in jar No. 7, the majority of the fish living 6 hours after they had begun dying in jar No. 3, though some individuals in No. 3 survived much longer than any in No. 7. It may be that the mixture of pond water derived from the melted ice hastened death in No. 7, for the experiment of Scheme VIII shows that this water is injurious. The results of Scheme III are probably the best, although only a small proportion of the original number came to the final best. The results of the experiment may be roughly summarized as follows:

1, It has been shown that the young shad cannot be kept alive in cans long enough to make a transatlantic voyage of ten or twelve days. 2. The length of time they can be kept in cans has been satisfactorily determined, being from eight days and ten hours to eight days and sixteen hours; in individuals, extending to ten days and twelve hours. The longest time hitherto made was that by Seth Green, who carried the young fish across the continent in seven days and ten hours. The motion of the water, caused by the jolting of car or steamboat, is probably rather beneficial than otherwise, and would be likely to prolong the life of the fishes. 3. The impracticability of a sudden change from fresh to salt water has been demonstrated. 4. It has been shown that a partial admixture of salt water is not injurious to the young fish: Scheme III, and Scheme XI. being almost equally successful. 5. It has been shown that a uniform temperature of from 60° to 70° is the most suitable, a slight deviation beyond those extremes being dangerous. 6. The superiority of spring over pond water has been most satisfactorily demonstrated. 7. The death of the young shad is undoubtedly due to starvation,—the umbilical sac having been absorbed at the end of five days they were then entirely without food. A microscopic examination of the intestines showed that they were utterly empty. A few of the surplus lot of fishes in the supply can were placed in a jar containing a handful of coarse sand and gravel, and, sinking to the bottom, they seemed busily employed among the sand and pebbles. Whether they found any food I do not know, but they were among the last to die, although very little attention was paid them.

The question of the possibility of transporting shad to Europe is one of much importance. The only feasible plans seem to be these: 1, to discover some means of feeding the young fish *in transitu*; 2, to start them on the voyage in the eggs, hatching them on the way or after their arrival; or, 3, to capture and transport the young fish after they have been free for some weeks and have by feeding gained the physical stamina to endure a two weeks' fast. Of the three alternatives, the first seems at present the most practicable; experiment may yet reach some other and better plan.

FRATER AQUARIUS.

UNITED STATES COMMISSION OF FISH AND FISHERIES.

THE FISH LABORATORY.

HEADQUARTERS U. S. COM. FISH
AND FISHERIES.
NOANK, Conn., Sept. 3.

At the water's edge, midway between the invertebrate Laboratory and the "Bluelight" wharf stands a small white wooden building, the headquarters of the fishing party. "Ichthyological Hall" some call it; others, irreverently, "The Shark's Parlor," but to its occupants, and to Noank in general, it is plainly and simply, "The Fish House." Most of the work of the party is done in their boats, but here the collections are preserved, dissections are made, and field-notes are written up.

At the start it must be confessed that the attractions of the other laboratory, and of the dredging work, are much the greater to our visitors—both on account of the novelty of the work and the greater variety of living forms brought up in the dredge-net. It is the misfortune of most persons to grow up with the impression that fishes were created only to be eaten: the names of fishes are usually associated with damp, slimy market-stalls, and the hideous clammy masses of flesh so often to be seen there. No one considers a fish "a curiosity," but the strange and lovely creatures drawn up from the unexplored bottom of the sea are new revelations, unexpected visions of beauty. Not a whit less curious and beautiful are our finny friends, if you see them as we see them, in their native element; every motion instinct with grace, their colors as delicate as these of a pearl or as brilliantly gorgeous as those of fire-opal. Here in the laboratory are only dead specimens, the only traces of their former beauty lingering in the note-book of the collector and in the portfolio of the artist. Then too, the apparatus used in collection consists merely of modifications of the nets and lines used by fishermen from time immemorial, and as familiar to all as the plough and the axe. Still a few words on the work and the laboratory, may be of interest.

In front is a platform-wharf, about twenty feet long, the end of which is occupied by a large reel on which the nets and seines are wound at night to dry. On the platform are piled oars, nets, coils of rope, and here may usually be seen several large fishes awaiting their fate,—sharks, sturgeons, skates or rays, brought in by the collecting parties or by the smacks.

In the channel lies the "Cygnet," our little sloop-rigged working yacht, and near by are moored the seining boats. Close at hand are tied the floating vivaria, the live car, a little covered boat with numerous holes in its sides and bottom, in which living fish are towed, and the Green hatching boxes used in the experiments in the artificial propagation of food-fishes.

A force pump supplied from the channel, furnishes fresh sea water to the aquarium, and aids in the frequent cleansings of the establishment. Entering the house we are saluted by the odor of alcoholic specimens, disagreeable at first, but sweeter than any incense to the nostrils of the naturalist.

The room is too small and too crowded with chairs and work-tables to allow extensive exploration, but the inspection can be quickly made. One wall is occupied by shelves and large copper tanks standing on the floor under them. The shelves and the rows of glass jars, bottles and phials, receive the smaller specimens; others go into the tanks; the skins and the largest specimens are packed in brine barrels which stand without the door. Another side of the room is occupiod by the refrigerators in which specimens may be kept in good condition for several days. On the table are some of the accessories of field-work, including compound microscope, dissecting instruments, drawing materials, graduated scales, balances, and note-books. Tanks of alcohol, harpoons, boat hooks, grappling irons, nets, and tall wading boots, hung up to dry, may be thrown in *ad libitum*, to complete the picture.

On the floor is stretched a huge specimen of the Land Shark (*Eugomphodus littoralis*) just brought in from the "Middle Ground" by the schooner "Caroline." (The advocates of fine tackle will be interested to learn that this fish, eight feet and ten inches long, weighing probably three hundred pounds, was taken with an ordinary sea-bass hook with a two-inch shank. The fisherman, when he found his hook taken, pulled up anchor and rowed in his sharpie to the smack, holding his line between his teeth and leading his captive with the greatest ease.) This is by far the largest of the species ever recorded, the ordinary adult of the species, "Johnny Shurks" as the Noankers call them, seldom are seen more than four feet long and fifteen or twenty pounds in weight. Mr. Blake is mounted on a stool near by, rapidly delineating his outlines. Another of the party is taking the measurements of a Tarpum (*Megalops thrissoides*)—a rare species, our fourth specimen from the coast, taken in Captain Rogers' pound at Squisset, near Woods' Hole, Massachusetts. An exquisitely formed creature it is, every line adapted to quick motion through the water, each fin sheathed in front by a case of overlapping scales, those of the back and under side of the tail clinging close to the body by a sucker-like prolongation of their last rays, its lower jaw prolonged far beyond the mouth in a point like the sharp bow of a yacht. The scales, glistening like plates of polished silver, present a smooth, yielding surface as the fish rushes through the water. Well can we believe the accounts of the rapidity of the fish and his enormous leaps out of water as he pursues the flying schools of menhaden and herrings. A third is busy over the stove, boiling and cleaning some skeletons, while still another stands over a table near by dissecting out the brain of a three foot "Mollicut" (*Lophius piscatorius*). Enthusiastically he summons all to admire the little globule of nervous tissue as it lies in its bath of crystal fluid, its complicated system of nerves branching out to nostrils, eyes, ears, jaws, heart and fins, reminding one of a central station communicating with many distant parts by submarine telegraph cables. The Doctor has injected the arteries with vermilion and their delecate arborescence may be traced through all their wanderings among the tissues

Two other occupants of the room are worthy of passing notice, as they sport their gay colors in the aquarium; one the Box-fish (*Chilomycterus geometricus*), his stomach of aldermanic proportions, though it is only filled with water which he throws from his mouth a distance of three feet and more if he is lifted out of water; the other a small Flag-tailed File-fish (*Alutera cuspicauda*), a near relative of the Orange File-fish described in the SPORTSMAN two weeks ago.

Any remarkable specimens are sent to Washington packed in ice, to be photographed and cast in plaster. Professor Baird's series of "Photographs of the Food Fishes of the United States" already includes some two hundred and fifty species, many of the pictures of remarkable beauty. Mr. Joseph Palmer, the taxidermist of the United States National Museum, is a master in the art of modeling in plaster; in his hands the collection of casts is rapidly growing. These are colored from sketches of the living fish, and for public exhibition are far superior to alcoholic specimens or stuffed skins. To the student they are also valuable, showing the unshrunken shapes and undistorted proportions of the newly caught fish.

FRATER AQUARIUS.

Sportsman IV 392 ?

[FROM THE AMERICAN JOURNAL OF SCIENCE AND ARTS, VOL. VIII, AUG., 1874.]

DESCRIPTIONS OF TWO NEW SPECIES OF FISHES FROM THE BERMUDA ISLANDS.

BY G. BROWN GOODE.

IN a collection of fishes, including some seventy species, made at the Bermudas in the spring of 1872, I find two forms apparently undescribed, descriptions of which are given below. As the marine life of the Bermuda group is essentially West Indian in its character, these species may be regarded as additions to the icthyological fauna of the West Indies.

1. *Diapterus Lefroyi*, sp. nov.

This species belongs to the genus *Gerres* as defined by Dr. Günther. It is distinguished from all other members of the genus and family by its relatively greatly elongated form. The body is fusiform, compressed, its greatest height, at the thoracic region, being a little less than one-fourth (·23) of the total length and a little more than one-fourth (·27) of the length without caudal (·89): in *Diapterus aprion*, the most elongated of the species hitherto described, the greatest height is but one-third of the length. The height of the body is uniform under the spinous portion of the dorsal, sloping gently and at a nearly uniform angle above and below to the middle of the caudal peduncle. The height of the body behind the dorsal (·10) is less than one-half, that of the least height of the tail (·06) is one-fourth of the greatest height of the body.

The scales are large, measuring ·03 and ·04 in height and ·02 and ·03 in length: they form about forty-five oblique transverse rows between the head and the caudal, four and one-half longitudinal rows between the back and the lateral line and ten between the lateral line and the belly.

The length of the head (·22) equals the greatest height of the body and is double the greatest width of the head (·11): the height at the pupil (·14) is double the width of the interorbital space (·07). The length of the snout (·06) equals the length of the operculum (·06); when the mouth is protruded the length of the snout is doubled (·12) and when retracted the posterior extremity of the intermaxillary process extends to the vertical through the center of the pupil. The nasals are very prominent and the nostrils are nearer to the orbit than to the extremity of the jaw.

The orbit is circular, its diameter (·08) one-third the length of the head. The origin of the dorsal is slightly behind that of the ventrals, its distance from the snout (·31) twice the length of its base (·16). The dorsal spines are graduated nearly in the proportion (I = ·02; II = ·12; III = ·11; IV = ·10; V = ·09; VI = ·085; VII = ·0725; VIII = ·05; IX = 04). The notch between the spinous and soft portions is very deep and the connecting membrane barely perceptible. In the soft dorsal the fifth ray is the longest (·09) and equals the fifth spine, the succeeding rays diminishing regularly to the last, which equals the ultimate spine (·04); the length of its base (·20) is greater than that of the spinous dorsal. The anal begins behind the center of the body (·56); the first spine is very short (·01), one-fifth the length (·05) of the second, which is slender; the first ray is the longest (·08), the succeeding rays regularly diminishing in length to the last (·03). The lobes of the caudal are equal, the outer rays in length (·21) five times the inner ones (·04). The extremity of the pectoral reaches the vertical from the last dorsal spine: its distance from the snout at the axilla (·25) is nearly equal to the height of the body. The ventral spine resembles the fifth dorsal spine in shape and size; the length of the longest ray (·11) slightly exceeds one-third of the distance from the snout to the ventral axilla (·30); the axillary appendage consists of four lanceolate scales, the first and longest as long as the last ventral ray.

Color: silvery, with a bluish tint above; axils of the pectorals and extremity of snout brownish.

Radial formula, D. IX, 10. A. II, 8. P. 12. V. I, 5. C. 3, 9, 9, 3.

The unit of measurement used above is one-hundredth of the total length, which in an average specimen is 7·29 inches (M. O. ·185). The species is common in the protected inlets about the islands in company with the "shad" (*Diapterus gula*), from which it is distinguished by the name "long-boned shad:" they are in demand for bait and are easily seized in large quantities. I take pleasure in dedicating the species to his Excellency, Maj.-Gen. J. H. Lefroy, F.R.S., Governor of the Bermudas, who while doing so much for the social and political welfare of the islands, is taking an active part in adding to our knowledge of their natural history.

2. *Engraulis chœrostomus*, sp. nov.

This species closely resembles *Engraulis surinamensis* (Blkr.) Gthr. differing from it, however, in several respects.

The height of the body (·16) is a little more than two-thirds of the length of the head and is contained six times in the total length and a little more than four times in the length to end of middle caudal rays (·90): the height at the ventrals is less (·13). The scales are large, in thirty-eight oblique rows between the head and the caudal.

The length of the head (·22) is less than one-fourth of the total and is double its height at the pupil (·11): its greatest width (·08) is about one-third of its length. The orbit is nearly circular and its diameter (·05) equals the length of the snout (·05) and the width of the interorbital area (·05). The snout projects far beyond the lower jaw, whose extremity just passes the vertical from the anterior margin of the orbit. The maxillary is dilated above the mandibular joint, rather tapering behind, and extends to the gill opening. The gill-rakers are fine, setiform, not longer than the eye (·05), about 25 on the lower branch of the outer branchial arch.

The origin of the dorsal fin is in front of the middle of the body (·45 from snout), and directly above the extremities of the ventrals: the length of the first ray (·06) is half that of the second (·12), which nearly equals the length of the base (.11).

The origin of the anal is at the middle of the body (·51 from snout) and below the posterior dorsal rays: its greatest height (·11) nearly equals that of the dorsal.

The length of the middle caudal rays (·08) is two-fifths of the outer rays (·20). The length of the pectorals (·11) equals the length of base of dorsal (·11), the extremities reaching to the origin of the ventrals. Length of ventrals (·09): distance from snout (·35).

Color: back and sides brownish, belly white; a broad, clearly defined lateral band of silver as wide as the diameter of the orbit (·05).

Radial formula D. 13–14. A. 23–24. Length 2·68 inches (M. O ·068).

Common in schools in Hamilton Harbor, where it is taken for bait in cast nets. Its enormous mouth has given it the name of "hog-mouth fry."

The types of these descriptions are preserved in the U. S. National Museum in Washington and the University Museum in Middletown, Conn.

[illegible] Vol. [illegible] [illegible] p. [illegible]
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THE PLAGOPTERINAE,
and the Ichthyology of Utah.

BY G. B. G.

One of the most interesting of recent contributions to the history of North American fishes is a paper by Professor E. D. Cope "On the *Plagopterinae* and the *Ichthyology* of Utah," reprinted from the Proceedings of the American Philosophical Society of Philadelphia. Dr. H. C. Yarrow, U. S. A., and Mr. H. W. Henshaw, the zoologists of Wheeler's survey, have, during the past two years, made extensive collections of the fishes of the Colorado River and its tributaries, and of Utah, and to their labors we owe the materials for this memoir.

The sub-family *Plagopterinae* which is here defined for the first time, appears to be confined to the basin of the Colorado River, and to be the only type peculiar to that region. It includes those *Cyprinidae* which have two strong osseous rays in the dorsal fin, the anterior of which has a groove in its hinder face, in which the posterior is received, the two forming a compound defensive spine. The ventral rays, except the first and second, are modified in much the same way, the lower part of each being osseous, dagger-shaped, and posteriorly grooved; their articulated extremities either continuations of their apices or emerging from the grooves below them. The author states that the only other instance of this ossification of the ventral rays is in the fossil family of *Saurodontidae* extinct since the cretaceous period. The family includes three genera, *Meda*, described by Girard in 1856, and represented by one species, *Meda fulgida*, from Arizona, *Plagopterus* and *Lepidomeda*, both new; the former represented by *Plagopterus argentissimus* from the San Louis valley, the latter by *Lepidomeda vittata* and *Lepidomeda jarrovii* from the Colorado Chiquito River. Twelve species were obtained from Utah Lake, five of them new to science, and from other parts of Utah and Arizona eight more, six of them new. The proportion of undescribed species in the collection, thirteen out of twenty-two, is quite remarkable.

We would venture the criticism that while Professor Cope's method of forming specific names from personal ones, may be in accordance with the strictest classical rules; it is hardly necessary to follow it to such extremes as *Minomus jarrovii* and *Rhinichthys henshavii*: the names *M. Yarrowi* and *R. Henshawi* are more euphonious and more intelligible and better serve the purpose of compliments to the gentlemen who discovered the specimens.

an account of the method of properly manipulating the adhesive eggs, which will be found in the appendix.

Fortunately the shad, striped bass, and the *Salmonidæ* generally, with perhaps only the exception of the smelt, have smooth or non-adhesive eggs, which permits them to be fertilized and readily manipulated without the inconvenience caused by their sticking together.

It is not my purpose to present here a treatise upon pisciculture in general, as I have nothing to add to the works already published on the subject, and which have been prepared by practical men of great experience. Among the most recent works are those published by Dr. J. H. Slack and Mr. Livingston Stone,* and in them will be found all the best-known methods of treatment, and especially for the trout. I hope, however, to present hereafter some special details in regard to other species that have been developed in connection with the operations of the United States Fish Commission.

The hatching of striped bass.

Nothing was known until recently as to the treatment of striped bass; but Mr. M. G. Holton, already referred to in connection with the improved apparatus for hatching the eggs of the *Salmonidæ*, while in the employ of Mr. Seth Green on account of the United States Fish Commission, at Weldon, N. C., took occasion to experiment with the spawn of several of these fish. To his surprise he found that it was non-adhesive, precisely like that of the shad, and capable of being treated in the same manner. The eggs were hatched out in four or five days, and with a small percentage of loss. They, however, were considerably smaller than those of the shad, requiring the bottom wire of the boxes to be much finer; twenty-two wires to the inch, at least, being needed.

It is unnecessary for me here to go into detail concerning the special method of treating the eggs of such fishes as the salmon-trout, the brook-trout, and other species, as these are discussed in detail by Mr. Milner in this volume, and are also considered at length in the various special American treatises.

Having thus presented a very brief indication of the history of multiplying certain of the food-fishes as practiced in modern times, and having explained the general principles of the method adopted for the purpose, I proceed to discuss more particularly the economical importance and history of the species of fish to which the attention of the commission has so far been more particularly directed, and of some of those which it is proposed to take up hereafter.

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* Practical Trout-Culture, by J. H. Slack, M. D. Orange Judd & Co., New York, 1872. Domesticated Trout: how to breed and grow them, by Livingston Stone, A. M. Boston, J. R. Osgood & Co., 1872.

1872-3

D—FISHES ESPECIALLY WORTHY OF CULTIVATION.

1.—*The shad.*

Among these fishes, the American shad, *Alosa sapidissima* may be considered as holding the chief place, occupying in its distribution as it does the entire eastern border of the United States from the Saint John's River in Florida to the Gulf of Saint Lawrence, and even occurring in limited numbers in the waters emptying into the Gulf of Mexico. Its abundance in the early history of the country was such as to excite the unbounded astonishment of those who beheld it for the first time. With scarcely an exception, every river on the Atlantic coast within the limits mentioned was invaded in the spring by immense schools, which in their upward course furnished an ample supply of the best food, first to the aboriginal inhabitants, and then to their European supplanters and their descendants.

At one time it was imagined that the whole body of American shad, having wintered in the South, started northward with the new year, sending out detachments as they proceeded along the coast, first into one river and then into the next, until the last of the immense school made their way into the Saint Lawrence River. This idea, which attached equally to many other species of fish, is now believed to be in great measure at least incorrect; and it is thought more reasonable to suppose that the young fish, hatched in any particular stream, go out into the sea, and remain within a moderate distance of the coast until the period again recurs for their upward migration.* It may be however that a coastwise movement takes place to some extent.

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* As a convenient place for the purpose, I introduce here an important contribution to the natural history of the shad, recently received from Mr. G. Brown Goode and Mr. Joseph Shepard:

"A knowledge of the occurrence of shad in the waters of the Saint John's appears to have been many years before the fishermen make any practical use of their information. Shad were not taken in quantity for the local markets until 1864 and 1865, though I am informed by Colonel Sammis, of Arlington, one of the oldest settlers of East Florida, that he knew of their capture in small numbers as early as the last Indian war (1839) and has since occasionally seen them. At that time the country was but sparsely settled, and there can have been little encouragement, and indeed little need for the use of seines, the inhabitants easily supplying their wants with the cast-net and the line.

"About 1859 or 1860 Mr. P. Waterhouse, a northern fisherman, introduced gill-nets and took shad in large numbers on the bar at the mouth of the Saint John's: these he shipped to northern markets, and it is said that he refused to sell a single fish in Florida, being angry with his neighbors for laughing at his project of catching shad in the Saint John's.

"All fishing was interrupted by the war, but immediately after its close gill-nets were extensively used and the shad were found to be very abundant. There can be little doubt that the species has inhabited the Saint John's for a great many years; the common idea that they are of recent introduction arises from the fact that through want of proper fishing they did not find their way to the markets till about ten years ago. The Saint Mary's River is still thought by many people living on its banks to be destitute of shad, Nothing but impassable dams or natural falls prevented the fish from making their way to the headwaters of our rivers, and their

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though there can be little doubt of their occurrence there also. As there is no market near, there is no object in fishing for shad; but an old fisherman assured me that he found them abundant there many years ago.

"The Saint John's fishermen do not use shad-seines, though small seines are employed along the banks of the river and in creeks to take the smaller species of fish. They do not seem to appreciate the superior advantages of the seine, and aver that the swiftness of the current prevents its use. This is absurd since the current of the Connecticut and other rivers, where seines are used to advantage, is much greater. As the present system fully supplies, and often gluts, the market there seems no immediate necessity for a change in the method of fishing.

"The gill-nets in use vary in mesh from three and one-half to four and one-quarter inches. They are about ten feet wide, and several gangs are fastened together so as to stretch nearly across the river, often a mile or more in width. The net is allowed to 'drive' or drift with the current, entangling in its meshes all the full-grown shad which it meets.

"The principal fishing-stations are near Mayport, on the bar at the mouth of the river, at Yellow Bluffs, and Trout Creek, respectively twelve and fifteen miles above, at Jacksonville, twenty-five miles from the mouth, and at Pilatka, a still greater distance up the river. Several nets are used at the head of the river, in Lakes Harney and Monroe and in Salt Lake, to supply the hotels there. The Pilatka fisheries are small and supply the local market. More than thirty nets are used in the neighborhood of Jacksonville, whence the fish are shipped, packed on ice in barrels, to Central Georgia and Florida, to the interior of Sourh Carolina, and to Alabama. Yellow Bluffs is another extensive market, and sends its fish to Savannah and the northern markets. The estimated total number of nets on the river is seventy-five.

"The largest haul of the past season was at Yellow Bluffs, where six hundred were taken from a single net; at Jacksonvile the largest haul was three hundred and twenty.

"The average price at the fisheries during the past season was 21 cents each.

"The hickory-shad (*Pomolobus mediocris*) usually makes its appearance in the Saint John's the first or second week in November; and as early as the 20th the first shad appear. The shad-fishing begins about the first week in December, and is at its best about the 1st of January. The season ends about the middle of April. At the time of my arrival, April 12, the last shad were in the markets. The herring (*Pomolobus pseudo-harengus*) accompanies the shad in great numbers, but is not caught much after the 1st of March. Two herrings or two hickory-shad count in the market for one 'white shad.' The dates given above are only approximate, taken from the memory of the fishermen and dealers; but as the testimony of the various persons interviewed agrees tolerably well, I believe them to be nearly correct.

"At the time of my visit the shad seemed to be in full spawning condition and were said to be very plentiful in the lakes of Central Florida, where the fishermen believe that most of them deposit their ova. At the time of their first appearance, the ovaries and spermaries are said to be barely distinguishable.

G. BROWN GOODE.

According to Professor Wyman the young shad, even as early as on the 1st of May, are met with in great numbers returning to the ocean and measuring three or four inches in length.

"The shad-season on the Saint John's, according to Mr. C. L. Robinson, of Jacksonville, is from the 1st of December to about the 8th of April.

"The first fishing done here for shad especially was by Captain Waterhouse, of Connecticut, two years before the war. The first year there were three persons engaged in the business as proprietors, working eight men and four nets. The next year there diffusion was almost universal, so that few portions of the country east of the Alleghany range were destitute of their share.

The fisheries were established on the river banks, and the farmers living at a distance from the streams were in the habit of coming in their wagons to these stations and hauling the fish to their homes, and there preserving such as were not needed at the time, for the winter's use. Sometimes the early settlers in new towns, remote from the rivers, before roads were cut through the forests, having no more convenient mode of transportation, were in the habit of taking their fish in bed-ticks hung across the backs of horses, in some well-authenticated cases for as many as thirty miles.

The fisheries were originally prosecuted almost entirely by the use of seines; and although at any one place very few were taken compared with the numbers now captured in connection with the great modern contrivances employed for the purpose, yet in view of their occurrence in every river and its subdivisions, it is by no means improbable that

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was double that number engaged and some twelve nets, and so increased until a year ago; this last winter there were between seventy and eighty nets and over one hundred men employed from Pilatka down.

"Above Pilatka, particularly in the lakes, there were many more employed, say twenty.

"This last winter the business was about the same as the year before. It is estimated that about 500,000 were shipped from the Saint John's, mostly to Savannah. From Savannah they are distributed to various points north.

"In size those caught here are not as large as those in the Connecticut River.

"Our fishermen use a net of 4⅞ inches mesh, while in the Connecticut they use a 5¼-inch mesh.

"They appear in our river coming in on their way to our upper lakes and creeks to spawn. When they come in they are fat and go into all parts of the river; but on their return, in June and July, they are very poor, and keep low in the deep water and follow the channel.

"Only a small portion of them return. It is thought they die of exhaustion, and are devoured by alligators and larger fish. The young shad go down to salt-water early the summer when they are about 1½ inches long. The fishermen are of the opinion that the shad have always been about as numerous as now in the Saint John's, but that the appliances for capturing them have been improved from year to year, and more persons engaged in it.

"The facts just presented are all from Mr. Robinson, and relate to the Saint John's River. I may say in addition, as regards our own waters, that there are a few shad taken every season in the Saint Mary's and Saint Illa by people living on those rivers for their own use: the net used being simply a hoop, 8 or 10 feet in diameter with handle 8 feet long, and held perpendicularly in the water by one man while another paddles the boat. When the holder of the net feels the fish against it, he brings it to the surface in the same manner as a scoop-net would be handled. From two to three and not unfrequently five or six are caught at one time in this manner. But I do not think that shad are as abundant in the above-mentioned rivers (which are narrow and deep) as they are in the (shoal and broad) river Saint John's

"Very respectfully, yours,

"JOSEPH SHEPARD,
"*Saint Mary's, Ga.*

"Hon. SPENCER F. BAIRD,
"*Commsssioner, Washington, D.* C."

About Snake's Eggs.

BY PROF. G. BROWN GOODE.

Mr. J. C. Christian, of Huntington, Ind., writes: "I have several times killed water snakes, which, when opened, contained upwards of twenty good sized young snakes, from six to seven inches long. Last summer, after pulling out a large stump, we found twenty-seven eggs, which we broke, finding in each a well developed young snake about nine inches long; afterwards we found and killed two snakes near the same place, about four feet long, and resembling the snakes in the eggs, and I supposed they deposited the eggs. I am satisfied that some snakes bring forth their young alive, while others lay eggs. Now is there any other class of animals which have more than one way of reproducing their young."

Mr. Christian has determined for himself a fact which has long been known to naturalists. Some snakes *do* lay eggs, while others give birth to living young, yet the difference is not so great as it may at first appear. We all know that every animal, in its earliest stages of development, is enclosed within the walls of an egg. That all life is produced from eggs, "*Omne vivum ex ovo*", is an adage handed down from the earliest times, and modern investigations have confirmed its truth.

Animals are either *viviparous*, *oviparous*, or *ovo-viviparous*. The first class includes all the highest animals, the *mammals*, or those which suckle their young; and in these the young animal derives its nourishment from the system of its parent, until it is strong enough for an independent life. In the other two classes, which ought really to be considered as one, the young animal is walled up at an early period within the outer coverings of the egg, and as it is now entirely separated from the parental system, it is nourished by a supply of nutritious material stored up within the egg, and which we call the *yolk*. When the young animal is sufficiently grown to care for itself, and the yolk of the egg is all used, it bursts the envelope of the egg, and is born. To this class belong birds, reptiles, batrachians (frogs, toads, etc.), fishes, insects, crustaceans (crabs and lobsters), worms, mollusks, and all the lower animals. *Oviparous* animals are those which "lay" their eggs to be hatched by the warmth of the parent's body, as in most birds; by the warmth or the soil or sun, as in reptiles; or by the warmth of the water, as in fishes. *Ovo-viviparous* animals, are those which do not lay their eggs, but retain them until the envelopes are broken, so that the young are born alive. The casual observer would be very likely to call these *viviparous*, but a study of their anatomy shows us that they are very close to the *ovipara*; in fact, the only difference is this, that the egg is delayed a little longer in the former, so that it is hatched *just before* it is laid.

This point established, it is not very hard to comprehend how it is "that some snakes bring forth their young alive, while others lay eggs." I know of a case where one of our common striped snakes (*Eutaenia sirtalis*) was kept in confinement, and having no satisfactory place in which to lay its eggs, retained them until after they were hatched, thus giving birth to its young alive. The same thing has been known to occur in the common English lizard, (*Lacerta agilis*), which is also usually oviparous. We find the same thing in other groups of animals; thus many of the sharks and skates of our sea coast, are oviparous, while others bring forth their young alive. The minnows (*Cyprinodentidæ*) of our brooks, show the same differences of habits, and parallel cases occur among frogs, snails, insects, and worms.

I can not state which of our species of snakes are *oviparous* or *ovo-viviparous*, for the very good reason that nobody knows. It is possible for the readers of the *Agriculturist* to make some very interesting contributions to science, by telling what they have seen. The breeding habits of most of the reptiles of North America are *totally unknown.* We know that the Rattlesnakes, the Copperheads, the Massaugas, the Mocassons, and some of the water snakes are usually *ovo-viviparous*, and that the Smooth Blacksnake, (*Bascanian constrictor*), the Milk or House-snakes, (different species of *Ophibolus*), some of the Bull-snakes, (species of *Pityophis*), the Grass-snake, (*Liopeltis vernalis*), and one or two other kinds, are usually oviparous, but of three-fourths of our snakes we know absolutely nothing.

It is probable that the young water snakes which Mr. Christian found inside of the larger ones, had been swallowed for temporary protection, and would soon have crawled out of their parent's mouth, had they not been prevented. The new-born water snake is not so long as six or seven inches.

[A year or two ago, the readers of the *Agriculturist* contributed a great mass of evidence, which went far to settle the question, "Do snakes swallow their young?" Every farmer, and every farmer's boy, and frequently the girls, can do something to add to the general stock of knowledge, and would be glad to do so if they only knew how. In this article Prof. Goode tells us one thing that they can do—to observe the manner in which snakes reproduce, and other methods will be pointed out in due time. To be very useful to science, one needs only a good pair of eyes, and a determination to use them. Record only what is seen, but do not see a part, and infer how the rest may be. The books are full of inaccurate observations, made by persons who tell more than they see. While we expect aid from those who can make observations in the field, we, on the other hand, would like to aid them, and if they come across things in regard to animals of all kinds, or plants, that they would like to have explained, they must send us their questions. **Ed.**]

Philadelphia Zoological.

Mr. G. Brown Goode of the Smithsonian Institution, a gentleman well-known to our readers, has been in Florida, collecting animals for the Zoological Garden, Fairmount Park, Philadelphia. Among the mammals there are two fine specimens of the southern Fox Squirrel (*Sciurus vulpinus*), one gray with black head, the other entirely black, an excellent instance of the "melanism" so common in this species; also a Gray or "Cat" Squirrel (*Sciurus carolinensis*) specifically identical with the Gray Squirrel of the Northern States, but smaller and more rufous upon the back. Also two "Salamanders" (*Geomys pineti*) familiar to Floridians as the animals which undermine the pine barrens so extensively, throwing up countless little hillocks of loose sand; they are pouched rats and closely resemble the Pocket Gopher (*Geomys bursarius*) of the western plains, so great a pest to the agriculturist. Eight or nine specimens were obtained, but only two were domesticated sufficiently to bring north, the others dying or escaping. A young Wood Hare (*Lepus Sylvaticus*) is included and an Earth Mole (*Scalops aquaticus,*) smaller and grayer than moles of the same species at the North.

The only birds shipped were ten pairs of Quails (*Ortyx virginianus*) of the Florida form, which are smaller, darker and have heavier bills than the Northern quails. A pair of Carolina Doves *Zenaedura carolinensis,*) some Parokeets (*Conurus carolinensis*) a Marsh Hen (*Rallus elegans,*) and a Sparrow-hawk (*Falco sparverius,*) were obtained, but all died in captivity before they could be shipped.

A large Alligator (*Alligator mississippiensis,*) over ten feet in length. There are also 20 Chameleons (*Anolus carolinensis*) in their liveries of green and scarlet, and 25 Scaly or "Alligator" Lizards (*Sceloporus undulatus,*) and a pair of Red-headed Lizards (*Piestiodon erythrocephalus*) the "Scorpions" so dreaded by the negroes, in spite of their harmless nature. Specimens of the Wood Lizard (*Lygosoma lateralis*) and the Snake Lizard (*Ophisaurus ventralis*) the so-called "Glass Snake" or "Joint Snake," were secured, but did not take kindly to captivity. The collection of snakes is especially complete, comprising, with a few exceptions, all the species which have been observed in Florida. Here are all the venomous snakes of the South, a pair of Diamond Rattlesnakes (*Crotalus adamanteus*) from the Indian river country, two Ground Rattlesnakes (*Crotalophorus miliarius,*) a Moccasin or "Cotton-mouth" (*Ancistrodon piscivorus.*) and a pair of Harlequins (*Elaps fulvius*) gorgeous in their bands of orange, black and crimson. The Garter Snake (*Eutaenia sirtalis,*) the King Snake (*Ophibolus getulus*), the Bead Snake (*Ophibolus coccineus,*) the "Calico" Snake (*Abastor erythrogrammus*) with its delicate tints of rose and purple, are here, as well, as a pair of the red "Chicken Snakes" of the Floridians (*Coluber guttatus.*) There are five slender Black Snakes (*Bascanion constrictor,*) and two Bull Snakes (*Pityophis melanoleucus*) the Horn Snake or "Rattlesnake's Pilot," who greets his visitors with hisses and puffs like a small steam engine. "Water Moccasins," are harmless water snakes, usually confounded with the poisonous Moccasin, which belongs to the Rattlesnake family. One is the *Tropidonotus fasciatus*, the other, with a copper colored belly, *Tropidonotus erythrogaster*. Several specimens of two species of Spreading Adders (*Heterodon platyrhinos* and *H. atmodes.*) Specimens of the Green Snake (*Cyclophis aesturis*) and of (*Coluber confinis*) escaped from their cages.

Among the turtles there are 19 "Gophers" or Elephant Tortoises (*Xerobates carolinus*) the peculiar tortoise of Florida, so much in favor with the peninsular negro for soups and other culinary compounds. Three large Leather-back Turtles (*Platypeltis ferox*) such as Bartram described in his Florida travels published a century ago. Also, two fine Green Turtles (*Chelonia mydas*) taken in Trout Creek, and thus saved from the Jacksonville epicures, with nine Yellow-bellied Terrapins (*Ptychemys concinna*) and a specimen of the Alligator Terrapin (*Cinosternum pennsylvanicum.*)

To sum up: The total number of specimens was 132, representing 32 species, distributed as follows: Mammals, 5 species; birds, 1; lizards, 4; serpents, 16; turtles, 5; amphibians, 1. A number of Florida wild hogs have been engaged and negotiations are being carried on for some Manatees (*Manatus americanus*) from the Indian River country.

Mr. Goode also sends two large tanks containing a collection of the fishes of the St. John's River, made in behalf of the U. S. Commission of Fish and Fisheries. Rod & Gun Mar 3 1875.

ALBINOISM IN FISHES.

MUSEUM OF WESLEYAN UNIVERSITY,
MIDDLETOWN, Conn., May 11th, 1875.

EDITOR FOREST AND STREAM:—

A remarkable specimen of the haddock (*Melanogrammus aeglefinus*) was shown me last Saturday by my friend Mr. Blackford, of Fulton Market. Your readers are many of them familiar with the appearance of this fish, with its uniform hue of brownish gray, slightly darker upon the back; the heavy black stripe which covers the scales of the lateral line, and the dark blotches behind and above the pectoral fins which mark the spots, we are told, pressed by the fingers of Simon Peter, the disciple fisherman, when he took the tribute money from the fish's mouth. Mr. Blackford's haddock is an albino, the only example in this group of fishes which has ever been brought to my notice. The stripes and blotches are absent, and the fish is uniformly a very light pink, the back slightly darker and approaching a very light salmon color. The scales have a pearly lustre. The fins are dull white tinged with rose color, except the ventrals, which are a light salmon color. The eyes are normal in color. This fish was taken off Barnegat, N. J., May 1st, by the schooner White Cloud, of New London. Mr. Blackford has had it forwarded to Washington for the use of the National Museum.

Another curious case is that of an albino of the common eel (*Anguilla bostoniensis*), sent to Professor Baird by Captain Elihu Potter, of Noank, Conn. Its color is a dull yellow of a light shade, approaching white on the belly. According to M. Dareste, albinoism is not uncommon in the European eels, and perhaps white eels may be more abundant with us than is usually supposed.

G. BROWN GOODE.

ALBINO FISHES.—Two interesting cases of albinism in fishes have recently fallen within my observation. The first was a specimen of the common haddock (*Melanogrammus æglefinus*), taken off Barnegat, N. J., May 7th, by the schooner "White Cloud," of New London, and shown to me by my friend, Mr. Blackford, of Fulton Market, New York. This fish, which was thirty-one inches long, was normal in every particular except in color. Its general hue was pinkish-white, with a pearly lustre, instead of the usual brownish-gray. The back and top of the head were slightly darker, approximating a very light salmon color. The black stripe which usually marks the lateral line and the blackish-brown blotch, behind and above the pectorals—the traditional mark of the thumb of the disciple Peter—were entirely absent. The fins throughout were yellowish white with a tinge of red, except the ventrals which were a shade darker. The slightest trace of the normal ashy tint of the belly might be discovered just below the origin of the pectorals.

The second instance is a specimen of the common eel (*Anguilla Bostoniensis*) taken in salt water at Noank, Conn., in December, 1874, and presented to the U. S. National Museum, by Capt. Elihu Potter. In this the color is a dull, pale yellow above, becoming nearly white beneath.

According to M. Dareste albinism is not uncommon among European eels. It appears, however, to be very exceptional in our waters. I have never seen or heard of an instance besides the case just cited. True albinism is especially uncommon among the members of the family to which the haddock belongs. The ground color of the cod and haddock varies much with the bottom on which they are taken, but I have never known of a case in which the spots and other markings were obliterated. A familiar instance of the influence of the color of the bottom is found in the rosy "rock-cod" of the coast of Maine, which is usually taken in the neighborhood of ledges covered with the bright red algæ such as *Ptilota serrata* and *Delesseria sinuosa*. In a similar manner the "butter-fish" (*Enneacentrus ouatalibi*) and the "grouper" (*Epinephelus fasciatus*) are influenced by the white coral-sand bottoms about the Bermuda Islands, but though they assume a very pallid hue, the character of their markings is quite unchanged.— G. BROWN GOODE, *University Museum, Middletown, Conn.*

[In the Fish collection of the Peabody Academy of Science there are examples of both of the above mentioned albinos. The haddock, agreeing with the description given by Prof. Goode, was taken off Newburyport some years ago, and sent to the Museum by Mr. Johnson of that place. The "white" eel was collected under the following peculiar circumstances: During the severe gale of Nov. 7, 1865, in Mass. Bay, a small *Cyclopterus* (lump fish) and the eel were washed aboard the schooner "Hero," Capt. Small, who found them on his deck after the gale and brought them to the Museum on his arrival at Salem the next day.—F. W. P.]

Chloral as a Preservative.—As it is very desirable that a substitute for alcohol be found for the purpose of preserving specimens, we copy the following from the New York "Tribune," trusting that trials of the experiment will be reported.

The "Philadelphia American Times" contains an article by Dr. W. W. Keen upon the anatomical, pathological, and surgical uses of chloral, in which he recommends this substance very strongly for the preservation of objects of comparative anatomy and natural history. It is used by injection into the blood vessels, or by immersion, and in his opinion it is likely to supersede many of the preparations now in use. Its special advantage is that the color of the object is preserved perfectly, and all the parts have a natural consistency, while there is nothing either poisonous or corrosive to affect the general health of the experimenter or to injure instruments.

For preserving a subject for dissection, half a lb. of chloral will suffice at a cost of a dollar or less. A solution for preserving specimens of natural history of ten or twelve grains to the ounce of water is quite sufficient, is much cheaper than alcohol, and the bottles instead of being hermetically sealed are closed by glass stoppers, or even ordinary corks. Dr. Keen has thus kept pus from various substances, and diseased growths of various kinds of other specimens for months, and found no change whatever in their character. Chloral is extremely antagónistic to fungi and infusoria, a very weak solution of it killing them instantly.

The deodorizing as well as the antiseptic properties of chloral are equal in Dr. Keen's opinion to those of any substance now known.

ADDENDUM B.

NOTES ON THE "SALAMANDER" OF FLORIDA (GEOMYS TUZA).

[*Communicated to the author by Prof. G. Brown Goode.*]

One of the most interesting mammals of the Southern Atlantic States is the species of *Geomys* known in Florida and Georgia as the "Salamander." The name of "gopher," by which the various representatives of this genus inhabiting the Upper Mississippi Valley are known, would seem very appropriate for this animal. It appears to be a corruption of the French "gaufre", and to refer to the manner in which the soil is honey-combed by the pouched rats.

Local usage, however, has appropriated this name to a kind of land-tortoise, *Xerobates carolinus*, (Linné) Ag., which is common in Georgia and Florida, and which also excavates a burrow, a habit to which, perhaps, it owes its name. I have never heard an explanation of the name "salamander" in its application to *Geomys tuza;* but it occurs to me that it may allude to the safety enjoyed by these little animals in their subterranean abodes at the time of the devastating fires which sometimes consume the pine-forests. After such a conflagration has passed over their heads, destroying every other kind of life, they are seen at work among the ashes, very good types of the salamander of fable, which passes unharmed over burning coals, and

> "with her touch
> Quenches the fire, though blazing ne'er so much."

Although the species was not scientifically described until 1817, it was noticed by several among the earlier writers. William Bartram, an English naturalist, who visited the Southeastern States in 1773, speaks of a large ground-rat, which he observed in the vicinity of Savannah, which was more than twice the size of the common Norway rat, and which in the night threw out earth, forming little mounds or hillocks.*

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*Travels through North and South Carolina, Georgia, East and West Florida, the Cherokee Country, the extensive territories of the Muscogulges or Creek Confederacy, and the country of the Chactaws. * * * —By William Bartram.—Dublin.—1793. p. 7. [Orig. ed. Philadelphia, 1791.]

A brief description of the species, under the name of the Hamster of Georgia, was published in the New York Medical Repository in 1802, and afterward in an appendix to the American edition of Bewick's Quadrupeds. On this description was founded the name *Mus tuza*, cited in the list of American mammals published by Ord in 1815,* a name which antedates that of Rafinesque by about two years, and which has been adopted by Dr. Coues.

Notwithstanding their great abundance, it is extremely difficult to obtain specimens of the salamanders. Their acute sense of smell gives them an early warning of the approach of danger, and they easily make their escape in the maze of tunnels. Should one even be driven into a blind passage, it would find little difficulty in baffling its pursuer, for it can burrow faster than a man can follow with a spade; and, since it obliterates its track by throwing the soil behind, it leaves scarcely more trace of its passage in the loose sand than a fish swimming through the water. It is thought quite impossible to dig them out. Occasionally, they are shot, when they come to the surface to throw out sand; but they remain in sight only an instant, and the marksman, to be successful, must have his gun bearing upon the opening at which the animal is expected to appear, with finger on the trigger, and be ready to pull the moment the head is sighted.

By the patient use of steel-traps, while in Florida this spring, I obtained a number of specimens, some of which I succeeded in keeping for several weeks, thus having an excellent opportunity of studying their habits.† They may easily be confined in a wooden box, with sides eight or ten inches high, having dry sand two or three inches deep on the bottom. No cover is necessary; I have never seen one look up from the earth, and have rarely known them to attempt to escape. They require no water, and no food except sweet-potatoes. A single potato of moderate size will feed a salamander for three days.

The senses of sight and hearing seem in them to be very dull. An object may be held within a short distance of their eyes without attracting their attention; but the moment one is touched, he turns with a jump, snapping fiercely, much to the detriment of fingers which may be near. If two are confined in the same cage, the one does not seem aware of the presence of the other, unless they accidentally come in contact. Their eyes are small, dull, and without expression. Their sense of smell I judge to be very delicate, from the manner in which they approach the hills of potatoes. Their motions are surprisingly quick and energetic; their activity never ceasing from morning to night.

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* Guthrie's Geography, 2d American edition, ii, 1815, p. 292.

† Two of them, which I sent to the Zoological Society of Philadelphia, may be seen in the garden at Fairmount Park.

They are very pugnacious, and a rough-and-tumble combat between two vigorous males would seem terrific, if their size could be magnified a few diameters in the eye of the spectator. Every muscle of their compact, elastic, stout bodies is brought into action, and they plunge and bite with wonderful ferocity. A battle is usually followed by the death of one or both. I have examined them after death, and found the whole anterior part of the body bruised almost to the consistency of paste, the bones of the legs crushed in four or five places. When two come together in the cage, their salutation is a plunge and a bite.

I watched their burrowing with much interest. They dig by grubbing with the nose and a rapid shoveling with the long, curved fore paws, assisted by the pushing of the hind feet, which remove the dirt from beneath the body and propel it back with great power a distance of eight or ten inches. When a small quantity of earth has accumulated in the rear of the miner, around he whirls, with a vigorous flirt of the tail, and joining fore paws before his nose, he transmutes himself into a sort of wheelbarrow, pushing the dirt before him to a convenient distance, and repeating the act until the accumulation is removed, then resuming his mining. Any root or twig which blocks his way is quickly divided by his sharp chisel-teeth. I have never seen a salamander place sand in his cheek-pouches, though I have watched their burrowing hour after hour. It is, of course, impossible to observe them when at work under ground, but I incline to believe that most of the refuse earth from the burrows is transported in the manner just described. The negroes told me that they had seen the salamander appear at the mouth of its hole for an instant and "spit out" the sand which it carried in its pouches, aiding the act by inserting the fore paws *into* the pockets. I have never met any one who could tell *exactly* what the salamander does at the instant he appeared, his motions being so quick that one cannot be quite sure; the general impression, however, is, that they are unloading their cheek-pouches. This is not at all improbable, for we know that they carry their food in these receptacles, and it seems a very natural way for them to bring their refuse sand to the surface, since they often have to transport it a distance of several feet. Still it is quite desirable to have other and more careful observations; for observers are apt to be deceived by their own eyes, especially in the light of preconceived opinions.

The subterranean labyrinth constructed by this clever army of sappers and miners penetrates the pine-barrens and cultivated fields in every direction. An energetic salamander, with a slight knowledge of engineering, would find little difficulty, I suspect, in making an underground journey through Florida from the Atlantic to the Gulf of Mexico. The direction of the burrows may easily be traced by the loose hillocks of white sand which are thrown up along the line at intervals of three or four feet. These are the "dumps" made by the burrower in throwing out his refuse accumulations. Each consists of about a peck of loose sand, and, by the casual observer, might easily be mistaken for an ant-hill. No opening is visible, but by digging under the hill a hole is found, the mouth of the adit to the main tunnel, which may be three feet below the surface if made in cold weather, but perhaps not more than six inches if in summer. One of these mounds is thrown up in a very few moments; I have seen thirty raised in a single night on the line of one tunnel; this would represent nearly one hundred feet of tunneling. I have seen one hundred and fifty in one continuous row raised in about two days; this would make between four and five hundred feet of burrow completed in that short time apparently by one little animal, an amount of work which may seem incredible to one who has not watched the restless movements of these animated plows, which are seemingly as well adapted for piercing the sand as birds are for cleaving the air. The burrows are about two and one-half inches in diameter, barely large enough to admit a man's hand, and, as has been stated, are at various depths below the surface. They meander in all directions, except in straight lines; their builders being guided apparently only by their whims or their olfactories. They, no doubt, intersect each other at many points, and one tunnel serves as a passage for a community, though fierce battles must often ensue when two rival claimants meet in a common highway.

The nests are large chambers, one or two feet from the main tunnel, with which they are connected by side-passages, which leave nearly at right angles. Here the miners lay up a supply of provisions, and the chambers are often found to contain a half-bushel of sweet-potatoes cut up into chunks as large as peach-stones, and of convenient size to be carried in the pockets. The salamander is a liberal provider. In this region, cellars are unknown, and sweet-potatoes are stored in heaps at the surface, covered with straw and sand. The salamanders are cunning enough not to throw up sand-heaps in the vicinity of these potato-heaps, but remove the loose earth into their old tunnels. When they once get access to the "tater-hake," they quickly remove its contents, and the owner wakes up the some morning to find his *cache* a hollow pretense. In these side-chambers, the salamanders rear their young, building a nest of grass, pine-needles, and live-oak leaves. I found them breeding in April.

The color of *Geomys tuza* is quite constant, light reddish-brown above, darker along the back, and lighter yellowish-brown beneath. One specimen was caught for me which showed a decidedly melanistic tendency, being nearly black. The measurements of a very large male are as follows: Nose to eye, $1\frac{1}{6}$ inches; nose to ear, $1\frac{5}{6}$; nose to root of tail, $11\frac{1}{8}$; tail from root to end of vertebræ, 3; arm, fore foot to end of claws, $1\frac{3}{4}$; leg, hind foot from heel to end of claws, $1\frac{1}{4}$; muzzle to bottom of cheek-pouch, 3; circumference of expanded mouth of pouch, 5; distance from tip to tip of the longest toes of the fore feet, when stretched apart at right angles with the body, $7\frac{3}{4}$; same measurement applied to hind feet, $6\frac{1}{2}$; girth of body behind shoulders, 5; distance from eye to eye, $\frac{3}{4}$; distance from ear to ear, $1\frac{1}{4}$.

The contents of one of the cheek-pouches in sand filled an old-fashioned silver tablespoon, heaped full. The contents of the pouch of an ordinary salamander will fill a dessertspoon in the same way.

[SEPARATELY REPRINTED FROM THE REPORT OF MAJ. J. W. POWELL'S EXPLORATION
OF THE COLORADO RIVER OF THE WEST AND ITS TRIBUTARIES. EXPLORED
IN 1869, 1870, 1871, AND 1872, UNDER THE DIRECTION OF THE SECRETARY
OF THE SMITHSONIAN INSTITUTION. CHAP. XIII, PP. 215 ET SEQQ.]

Department of the Interior:

U. S. NATIONAL MUSEUM.

— 5 —

BULLETIN

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1876.

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This work is the fifth of a series of papers intended to illustrate the collections of Natural History and Ethnology belonging to the United States and constituting the National Museum, of which the Smithsonian Institution was placed in charge by the act of Congress of August 10, 1846.

It has been prepared at the request of the Institution, and printed by authority of the honorable Secretary of the Interior.

JOSEPH HENRY,
Secretary Smithsonian Institution.

SMITHSONIAN INSTITUTION,
Washington, November, 1875.

CATALOGUE

OF THE

FISHES OF THE BERMUDAS.

BASED CHIEFLY UPON THE COLLECTIONS OF THE UNITED STATES NATIONAL MUSEUM.

By G. BROWN GOODE, M. A.
ASSISTANT CURATOR U. S. NATIONAL MUSEUM.

WASHINGTON:
GOVERNMENT PRINTING OFFICE.
1876.

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INTRODUCTORY REMARKS.

A visit to the Bermudas during the months of February and March, 1872, afforded opportunities for collecting the notes and specimens upon which the present paper is based. The enumeration of species here attempted, although necessarily far from exhaustive, is believed to indicate, with some degree of accuracy, the character of the ichthyological fauna of the group; and it is hoped that this list, with its annotations, may not be without interest as a contribution to geographical zoology. Surprisingly little has been done by naturalists in the investigation of the marine life of this region, interesting as it is likely to prove on account of its isolated, mid-atlantic position, the peculiarities of its climate, and its proximity to the Gulf Stream, rendering so easy observations upon the influence of ocean-currents in the distribution of living forms. The ichthyologist finds here the best of opportunities for the study of pelagic and migratory species. A broad field lies before some resident naturalist who will do for the ichthyology of the Bermudas what Poey and Bleeker have done and are doing for that of the East and West Indies. Comparatively little could be done in two months, least of all in winter and early spring, when stormy weather rendered explorations of the reefs impracticable, and often prevented the fishermen from leaving their moorings in the harbors. At the time of my visit, only seven species of fishes had been recorded from this locality; and the only authentic information regarding the fish-fauna was contained in one chapter, which was unfortunately very short, of Mr. Jones's admirable little work,* the author at that time not having turned his attention to the study of this class. The list given by Godet† should be ignored, as it is taken almost bodily from Gosse's "Naturalist in Jamaica."

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*The Naturalist in Bermuda; a sketch of the geology, zoology, and botany of that remarkable group of islands; together with meteorological observations. By John Matthew Jones, esq. (of the Middle Temple), assisted by Maj. J. W. Wedderburn (late 42nd Roy. Highlanders) and J. L. Hurdis, esq.—With a map and illustrations.—"Every kingdom, every province, should have its own monographer."—Gilbert White. London: Reeve & Turner, 238, Strand.—1859. 12mo, pp. xii, 200.

†Bermuda, its History, Geology, Climate, Products, Agriculture, Commerce, and Government. By T. L. Godet. London, 1860. 12mo.

In the present list, I enumerate seventy-five species, most of which were personally observed; for convenience of reference, all species known to occur in this locality have been included. In working up my notes, I have endeavored to supplement previous descriptions by (1) descriptions of the colors of the fishes *while living*, (2) notes on size and proportions, (3) observations on habits, (4) hints in reference to the origin and meaning of their popular names, (5) notes upon modes of capture and economic value. The meaning of the specific names employed has been defined by partial synonymies, to which critical notes are occasionally appended. To make the list a more complete contribution to chorological knowledge, a brief note has been given upon the geographical distribution of each species.

The scheme of classification proposed by Professor Gill * has been followed throughout. I am indebted to Professor Gill for valuable suggestions and the identification of two or three of the more doubtful species.

TOPOGRAPHY OF THE ISLANDS.

The general topography of the Bermudas is so well known that no detailed account will be necessary. It may not be out of place, however, to refer to those features which bear more particularly upon the homes of the fishes. The sunken atoll, which is the foundation of the group, is shaped like an ellipse, its major axis twenty-five miles in length, its minor axis thirteen. The major axis runs in a northeast and southwest direction, the chain of main islands lying on the southeast edge of the ellipse, and forming a nearly continuous line twenty-six miles long, the lower or western end curving, nearly in the shape of a shepherd's crook or a fish-hook, to the southernmost focus of the supposed curve. The main islands, five in number, are separated by narrow channels, fifteen or twenty feet in depth, and their shores are deeply indented by shallow bays and lagoons. The reef, which approaches within a few hundred yards of the shore of the main islands on the south, is distant on the north and northwest from five to nine miles; the intervening space is crossed and recrossed by submerged reefs and ledges of coral limestone, and dotted in the neighborhood of the main islands by smaller islands and emerging ledges to the number of three hundred or more. The harbors are not particularly calm, but there are many broad bays whose surface the severest storms scarcely ripple. Within the encircling reef the depth of water rarely exceeds twelve and fourteen fathoms, while beyond this reef the bottom rapidly slopes to the level of the Atlantic bottom. Twenty miles to the southwest by west are two or three ledges, to which the fishermen resort for line-fishing in fine weather.

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* Arrangement of the Families of Fishes or Classes Pisces, Marsipobranchii, and Leptocardii. Prepared for the Smithsonian Institution by Theodore Gill, M. D., Ph. D. Washington: published by the Smithsonian Institution, November, 1872. 8vo, pp. xlvi, 50. (Smithsonian Miscellaneous Collections, 247.)

Catalogue of the Fishes of the East Coast of North America, by Theodore Gill. < Report on the Condition of the Sea Fisheries of the South Coast of New England in 1871 and 1872, by Spencer F. Baird, Commissioner, &c. pp. 779–822.

Catalogue of the Fishes of the East Coast of North America, by Theodore Gill, M. D. Ph. D. Washington. Published by the Smithsonian Institution, 1873. 8vo, pp. 50. (Smithsonian Miscellaneous Collections, 283.—A reprint of the preceding).

On the Limits of the Class of Fishes. By Theodore Gill, M. D., Ph. D. < American Naturalist, vol. vii, pp. 71–77, February, 1873. (Reprinted with repagination, 8vo, pp. 9; no title-page.)

The Number of Classes of Vertebrates and their Mutual Relations, By Prof. Thedore Gill. (Abstract of a Communication to the National Academy of Sciences, made October 29, 1873.) < American Journal of Science and Arts, vi, December, 1873, pp. 432–436. Reprinted with repagination, 8vo, pp. 4; no title-page;) also reprinted Annals and Magazine of Natural History, (London,) xiii, pp. 71–73, Jan. 1874.

Article *Fish* and descriptions of the various families, prepared by Professor Gill, as associate editor in the department of zoology, &c. < Johnson's New Universal Cyclopædia and Popular Treasury of Useful Knowledge. * * * A. J. Johnson & Son, New York.

FISHERIES AND FISH-MARKETS.

The Bermudian fisheries have always been famous. A large number of the poorer islanders, particularly the negroes, are professional fishermen, and are bold and skillful sailors, though their ambition only suffices to keep them at work when purse and larder show signs of exhaustion. Every cottage has its little garden, where bananas and sweet-potatoes grow for the trouble of planting, so that the fishermen are not entirely dependent upon their occupation for support, and the supply of fish often falls far short of the demand, and this is especially the case in the winter, when the landing of a boat is the signal for a general rush to the shore. The people of Bermuda, over twelve thousand in number, are dependent chiefly upon the fisheries for their animal food. Large shipments of cattle and sheep are received from the United States, but these are monopolized by the wealthier classes and by the garrison, so that their flesh rarely finds its way to the tables of the negroes, who number over seven thousand, or of the poorer white colonists, who constitute more than one-half of the remaining population.

The fishing-boats are built in the English style, drawing five or six feet of water, deep-keeled, sloop or schooner rigged, and usually provided with a large well in the hold, in which the fish are brought in alive.

The only market is the water's edge. In the large towns, Hamilton and St. George's, the quay is lined nearly every morning at sunrise by a long row of fish-boats. The fish swim in the wells until customers are found for them; when one is selected, it is taken up in a landing-net or by a gaff-hook, and quickly killed by thrusting a sharp awl into the base of the brain; it is then bled, skinned (rarely scaled), eviscerated, and delivered into the hands of the purchaser, a loop of palmetto fiber always being attached for convenience in carrying. At an early hour the fares are disposed of, and the boats are under weigh for the fishing-grounds. At almost any time, however, row-boats filled with small seined fish may be found at the quay. Those who live in the country-parishes watch the return of their neighbors' boats at night-fall, and thus secure their supplies of fish.

Fish from such a market cannot fail to be fresh, and the excellence of the Bermuda food-fishes is due to this, and to the fact that they are never allowed to die of suffocation in the air, but are killed quickly and bled. The Angel-fish (*Holacanthus ciliaris*) is perhaps the most highly esteemed; next in rank are the various species of *Pristipomatidæ*, *Serranidæ*, and *Sparidæ*, with the Hog-fish (*Lachnolæmus falcatus*). All others are regarded inferior in quality. The price of fish is fixed by law at fourpence a pound, an advance of one penny having been made within a few years.

Most of the line-fishing is done among the outer reefs or on the outer banks, twenty miles distant. The favorite baits are the flesh of the "Bermuda lobster" (*Palinurus americanus*) and the "Spanish lobster" (*Scyllarus æquinoxialis*), and that of some of the larger fishes, such as the "Mackerel" (*Orcynus alliteratus*), and the Morays (*Murænidæ*). The Pilchard (*Harengula macrophthalma*), Shad (*Eucinostomus gula* and *E. Lefroyi*), and the Robin (*Decapterus punctatus*), are used as "full-baits," as are also the various kinds of "fry" (*Atherina* and *Engraulis* sp.). The "Scuttle," a large *Octopus*, very common on the reefs, is also frequently used, its toughness making it a very lasting bait. Many of the choicest and largest species, such as the *Pristipomatidæ*, *Serranidæ*, and *Scombridæ*, are taken exclusively with lines.

The *Sparidæ*, *Labridæ*, *Scaridæ*, the smaller *Serranidæ*, and many others, with great quantities of the large crustaceans so much in demand for bait, are captured in basket-work fish-pots constructed of split cane.

These are built on the same principle with the lobster-pots in use on the New England coast, but are very peculiar in shape. A fair idea of one of them may be gained by imagining two crockery-crates placed together, with the ends at an angle so as to form a very thick capital letter V, with arms about four feet square, the entrance being through a funnel-shaped aperture placed in the inner angle. Smaller and more portable pots, made after the same model in annealed wire, are also in use. Such pots are baited with fish or lobsters, and anchored in two or three fathoms of water.

Shallow seines, a hundred yards or so in length, are plied in the bays, and with them are taken vast numbers of the smaller school-fishes, such as *Sargus variegatus*, *Pimelepterus Boscii*, *Mugil liza*, *Eucinostomus gula*, *Eucinostomus Lefroyi*, *Hemirhamphus Pleii*, *Decapterus punctatus*, &c. These seines are usually tanned with the bark of the mangrove-tree, (*Rhizophora mangle.*)

Circular casting-nets, ten feet in diameter, are used with much dexterity in capturing small fish for bait.

The "grains," a heavy, two-pronged instrument, resembling an ordinary fish-spear or gig, is carried in every boat, and used in striking large fish. The skillful grainsman seldom misses his mark, and in these waters, clear as crystal, this instrument is effective at the depth of ten or twelve feet.

During the winter months, recourse is had to the fish-ponds, which are stocked with the surplus of the summer's catch. These are of simple construction, usually natural pools in the rocks, or protected coves, inclosed by loosely-laid stone walls. Hundreds, sometimes thousands, of large fishes are here stored up for seasons when the severity of the weather is such as to prevent the usual visits to the fishing-grounds. The largest of these, the "Devil's Hole," on Harrington Sound, is visited by almost all the strangers on the islands, a small fee being charged for the privilege of seeing the fishes feed. Several hundred large Groupers and Hamlets (*Epinephelus striatus*) are usually confined here; and, when bait is thrown into the pond, the visitor can see only a close array of widely-stretched hungry mouths, each six or eight inches in diameter.

THE RELATIONS OF THE BERMUDIAN FISH-FAUNA.

These islands, considered in reference to their marine fauna, lie on the extreme northern and eastern boundary of the West Indian "Region." All the more characteristic fishes of this "Region" are represented in Bermudian waters, and the invertebrate fauna, as far as investigated, appears to have very similar relations. The reef-building polyps find here their farthest northern remove from the equator. That the subtropical character of the marine fauna and flora is determined to a great extent by the influence of the Gulf Stream is rendered very evident by comparing the life on the land with that of the surrounding waters. The latter is much the more tropical and West Indian in character; while the former, although many West Indian species are represented in the flora, is a curious assemblage of forms brought together from various quarters by winds, ocean-currents, and the agency of man. Drift-wood and seeds from the Antilles are cast up in great quantities with the flotsam and jetsam of the shore, and many of the commonest plants of the Bermudas are supposed to have found their way thither in this manner. Thus the transporting power of the Gulf Stream appears to have been quite as important in the introduction of tropical forms of life to this group as has been its thermal effect in rendering it a suitable home for them. Since the Bermuda atoll is comparatively recent in origin, it is not difficult to believe that it has thus been supplied with living forms. Many fishes of the West Indian fauna have been found in the waters of the Azores, Canaries, Madeira, the Cape Verde Islands, and other points in the Eastern Atlantic; it appears easy to account for their wanderings by an extension of the action of the same transporting agent.

The occurrence of several strictly European species is also to be noted. All of these appear to be powerful, rapid swimmers, with the exception, perhaps, of *Synodus lacerta*.

The subjoined tables are intended to exhibit the geographical relations of the fishes observed in Bermudian waters. Several of the species mentioned in the paper are not included, since confusion in their synonymy has rendered their limits of distribution doubtful.

The total number of species enumerated is 75. Of these, 18 are so widely distributed as to be of little importance in a comparison of this nature. Of the 57 remaining, 50, or 86 per cent. (68, or 89 per cent. of the whole number, 75), are common to the Bermudas and the West Indies; 18 species, or 32 per cent. of the whole, or 37 per cent. of those common to the two faunas compared above, occur on the coast of Brazil, only 2, however, south of Bahia; 8 species, or 14 per cent., are found on the eastern coast of the United States north of Georgia; 4 of these are undoubtedly accidental there, while 2, *Decapterus punctatus* and *Paratractus pisquetus*, have a range along the coast from Rio de Janeiro to Cape Cod, and the seventh, *Anguilla bostoniensis*, is not sufficiently established in its specific relations to warrant generalizations; 13 species, or 23 per cent., occur in the Eastern Atlantic; 3 of these have not been recorded west of the Bermudas, and I prefer for the present to consider them as wanderers from the Mediterranean fauna. The relations, faunally, of others, such as *Balistes capriscus* and *Pimelepterus Boscii*, are somewhat problematical.

Four species of marine fishes and one inhabiting brackish water are known to be peculiar to the group.

Species common to the Bermudas and West Indies.

Ostracium triquetrum.
Pseudoscarus superbus.
Pseudoscarus cœruleus.
Chœrojulis radiatus.
Lachnolæmus falcatus.
Eucinostomus Lefroyi.
Acanthurus cœruleus.
Sarothrodus bimaculatus.
Calamus megacephalus.
Calamus orbitarius.
Lutjanus caxis.
Mesoprion aya.
Trisotropis guttatus.
Epinephelus striatus.
Epinephelus guttatus.
Hypoplectrus puella.
Mugil liza.
Auostoma coloratum.
Hemirhamphus Pleii.
Exocœtus exiliens.
Megalops thrissoides.
Sardinella anchovia.
Harengula macrophthalma.
Echidna catenata.
Zonichthys fasciatus (South Carolina).

Common to the Bermudas, West Indies, and Eastern Atlantic.

Chilomycterus reticulatus (Saint Helena).
Chilichthys Spengleri (Madeira, Cape Verdes, and Western Africa).
Ostracium quadricorne (Saint Helena, Western Africa, Cape of Good Hope).
Sphyræna picuda (river Niger).

Common to the Bermudas, Brazil, Cape Verdes, and Ascension Island.

Salarias textilis.

Common to the Bermudas, West Indies, and Northern Brazil.

Malthe vespertilio.
Scarus radians.
Eucinostomus gula.
Hypeneus maculatus (Rio de Janeiro).
Holocentrum sogo.
Pareques punctatus.
Hæmylum capeuna.
Hæmylum chrysopterum.
Trisotropis undulosus.
Hemirhamphus Pleii.

Common to the Bermudas, West Indies, Brazil, and the Eastern Atlantic.

Labrosomus nuchipinnis (Gorea).
Harpe rufus (Saint Helena, Rio de Janeiro).
Glyphidodon saxatilis (Cape Verde Islands; accidental in New England).
Enneacentrus punctatus (Cape Verde Islands).
Gymnothorax moringa (Saint Helena).

Common to the Bermudas, West Indies, Brazil, and the east coast of the United States.

Acanthurus nigricans (South Carolina).
Decapterus punctatus.
Paratractus pisquetus.

Common to the Western Atlantic and Western Pacific??

Anguilla bostoniensis.

Common to the Bermudas, Mediterranean, and Eastern Atlantic.

Sargus variegatus (Madeira).
Sphyræna spet (Canaries).
Synodus lacerta (Madeira).

Common to the Bermudas, West Indies, Madeira, and the Mediterranean.

Pimelepterus Boscii (accidental at New York).

Common to the Bermudas, West Indies, east coast of United States, Madeira, Mediterranean, and the Pacific.

Balistes capriscus.

Pelagic: Atlantic.

Hippocampus, sp.
Dactylopterus volitans (Mediterranean).
Exocœtus, sp.
Mustelus canis.
Isuropsis punctata.

Pelagic: both hemispheres.

Paradiodon hystrix.
Alutera scripta.
Antennarius marmoratus.
Trachurops crumenophthalmus.
Orcynus alliteratus.
* Naucrates ductor.
Coryphæna hippurus.
* Leptecheneis naucrates.
* Ptheirichthys lineatus.
Regalecus gladius.
* Sphyrna zygæna.
* Reniceps tiburo.

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* Not personally observed.

Peculiar to the Bermudas.

Syngnathus Jonesii.
Lefroyia bermudensis.
Engraulis chœrostomus.
Fundulus bermudæ.

Acclimated.

Carassius auratus.

POPULAR NAMES.

The names in use among the fishermen afford some curious studies. Where practicable, hints in regard to their origin have been given.

I observe that of the thirty-three names given by Catesby* as in use in the Bahamas at the time of his visit to those islands, one hundred and fifty years ago (1724–25), twenty-six are applied to common species in the Bermudas. Nearly all of these are applied to fishes of the same family or genus, and most of them to the same species. This may perhaps be explained by the common origin of the colonists of the two regions. It is an interesting instance of the persistency of common names. Many of these names are in use at the present time in the southern Atlantic States, though usually applied to different species.

Subjoined is a list of names in use among the fishermen, to the application of which I can give no clew:—

Glare-eye Squirrel.
Black Jack.
Deer Grouper.
Spanish Hog-fish.
Black Hog-fish.
Clucker.
Sand-eel.
Runner.
Blue-bone Porgy.
White-bone Porgy.
Shad Porgy.
Scotch Porgy.
Red-tail.
Bone-fish.
Grubble.
Yellow Tang.
White Belly.
Blue Belly.
Permit.
Sand Shark.
Sunburnt Shark.
Rainbow.
Thumper.
Mermaid.
Skip-jack.
Slippery Dick.
Prickly Hind.
Sardine.
Sand Mullet.

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* The Natural History of Carolina, Florida and the Bahama Islands; containing The Figures of Birds, Beasts, Fishes, Serpents, Insects and Plants: Particularly the Forest-Trees, Shrubs and other Plants not hitherto described or very incorrectly figured by Authors. Together with their Descriptions in English and French. To which are added, Observations on the Air, Soil and Waters: With Remarks upon Agriculture, Grain, Pulse, Roots, &c. To the Whole is Prefixed a new and correct Map of the Countries Treated of. By MARK CATESBY, F. R. S. London * * * * MDCCCXXXI–XLIII. 2 vols. folio.

The English names given to the species in this paper are those which are commonly applied to them by the islanders, and no others are employed.

The following identifications of Catesby's species are suggested in connection with the plates of fishes given in the second volume. These conclusions were reached after a careful examination of the synonymy of the names here proposed as adopted by later writers, especially Linné, who appears to have founded several species upon these figures and descriptions. In many cases, comparative measurements have been made with these plates and the fishes they are supposed to represent, so as to make the identification as accurate as might be. A casual comparison will show the reader how closely the local names correspond to those in use in the Bermudas:—

T. 1. Umbla minor, marina, &c. (BARRACUDA) is *Sphyræna picuda.*
Vulpis Bahamensis is *Albula conorhynchus.*

T. 2. Perca marina gibbosa, &c. (THE MARGATE FISH) is (?) *Hæmylum chrysopterum.*
Saurus ex cinereo nigricans (THE SEA SPARROW HAWK) is *Synodus fœtens.*

T. 3. Perca marina, pinna dorsi divisa (THE CROKER) is *Micropogon undulatus.*
Perca marina rubra (THE SQUIRREL) is *Holcocentrum sogo.*

T. 4. Perca marina rhomboidalis (THE PORK FISH) does not agree with *Lagodon rhomboides,* to which it has been referred. The figure is too indefinite for determination and does not agree with the author's description.
Perca marina pinnis branchialibus carens (THE SCHOOLMASTER) is equally indefinite; the pectoral fins were evidently an afterthought of the artist.

T. 5. Perca marina venenosa, &c. (THE ROCK FISH) is *Trisotropis guttatus,* or some allied species.

T. 6. Perca marina capite striato (THE GRUNT) is some species of *Hæmylum,* perhaps *H. arcuatum.*
Albula bahamensis (THE MULLET) is *Mugil* sp.

T. 7. Perca marina puncticulata (THE NEGRO FISH) is *Enneacentrus ouatalibi.*
Perca cauda nigra (THE BLACK-TAIL) is very like *Ocyurus chrysurus.*

T. 8. Hirundo (THE FLYING FISH) is unidentifiable, but is probably the common Barbados species, perhaps *Exocœtus Roberti,* M. & T.
Perca marina sectatrix (THE RUDDER FISH) cannot be recognized, but is probably one of the *Stromateidæ.*
Perca fluviatilis gibbosa ventre luteo (THE FRESH-WATER PEARCH) is *Pomotis vulgaris.*

T. 9. Turdus pinnis branchialibus carens (THE MANGROVE SNAPPER) is quite unrecognizable, the grotesque figure without pectoral fins being evidently imaginary.

T. 10. Turdus rhomboidalis (THE TANG) is *Acantharus nigricans.*
Turdus cauda convexa (THE YELLOW FISH) is probably *Enneacentrus ouatalibi. Compare* T. 7, *supra.*

T. 11. Turdus flavus (The Hog Fish) is perhaps *Harpe rufus;* is certainly a Labroid.

Turdus cinereus peltatus (The Shad) is a *Eucinostomus*, and closely resembles the new Bermuda species *E. Lefroyi.*

T. 12. Turdus oculo radiato (The Pudding-wife) is a young specimen of *Chœrojulis radiatus.*

Alburnus americanus (The Carolina Whiting) is clearly *Menticirrus alburnus*, with which its shape and the barbels on the chin would place it, in spite of the manifest omission of the second dorsal fin.

T. 13. Mornnyrus ex cinereo nigricans (The Bone-fish) I am unable to identify, though the name is in use at the present day in the Bahamas.

T. 14. Cugupuguacu Brazil (The Hind) is *Epinephelus guttatus.*

Saltatrix (Skipjack) is *Pomatomus saltutrix.*

T. 15. Suillus (The Great Hog-fish) is *Lachnolæmus falcatus.*

T. 16. Aurata Bahamensis (The Porgy) is probably *Chrysophrys auratus* or *C. orbitarius.*

T. 17. Salpa purpurescens variegata (The Lane Snapper) I cannot place.

Petimbuabo Brazil (The Tobaccopipe-fish) is *Fistulari tabaccaria.*

T. 18. Novacula cœrulea (The Blue-fish) is *Pseudoscarus cœruleus.*

T. 19. Unicornis, Piscis Bahamensis (The Bahama Unicorn-fish) is *Alutera scripta.*

T. 20. Muræna maculatus, nigra et viridis (The Muray) closely resembles *Gymnothorax rostratus.*

T. 21. Muræna maculata nigra (The Black Muray) is not clearly identified.

T. 22. Turdus oculo radiato (The Old Wife) is *Balistes vetula.*

T. 23. Bagre, &c. (The Cat-fish) somewhat resembles *Noturus flavus.*

T. 24. Harengus minor Bahamensis (The Pilchard) is some small Clupeoid.

T. 25. Anthea quartus, Rondeletii (The Mutton-fish) is a *Lutjanus*, perhaps *L. aya* or some allied form.

T. 26. Remora (The Sucking Fish) belongs of course to *Echeneididæ*, though lack of detail will not allow even generic identification.

T. 27. Solea lunata et punctata (The Sole) I do not know.

T. 28. Orbis lævis variegatus (The Globe Fish) is *Chilichthys turgidus.*

T. 29. Psittacus piscis viridis, Bahamensis (The Parrot Fish) is *Pseudoscarus Catesbyi.*

T. 30. Acus maximus squammosa viridis (The Green Gar-fish) is *Lepidosteus osseus.*

T. 31. Acarauna major pinnis cornutis (The Angel Fish) is *Holacanthus ciliaris.*

FISHES OF THE BERMUDA ISLANDS.

LIST OF SPECIES.

MALTHEIDÆ.

MALTHE VESPERTILIO, (*Linn.*) *Cuv.*, subspecies VESPERTILIO.

DEVIL-FISH.

Lophius fronte unicorni, LINNÉ, Mus. Ad. Fried. 1, 1754, 55.—ARTEDI, Syn. Pisc. 1788, 88.

Guaperva, BROWN, Hist. Jamaica, 1756, 457, pl. 48, f. 3.

Rana piscatrix americana, SEBA, Locup. Rer. Nat. Thes. Desc. 1, 1758, 118, tab. lxxiv, f. 2.

Lophius vespertilio, LINNÈ, Syst. Nat. ed. 10, 1, 1758, 236; ed. 12, 1, 1766, 402.—GMELIN, Linn. Syst. Nat. 1, 1788, 480 (*partim*).—BLOCH, Ichth. iv, 1787, 8, taf. cx. (on a drawing by Plumier).—SCHNEIDER, Bloch, Syst. Ichth. 1801, 140.—LACÉPÈDE, Hist. Nat. Poiss. 1, 1798, 302–315.

Malthe vespertilio, CUVIER, Règne Anim. 1817.—MÜLLER & TROSCHEL in Schomburgk, Hist. Barbados, 1848, 678.—GÜNTHER, Cat. Fish. Brit. Mus. iii, 1861, 200 (*partim*).—POEY, Mem. ii, 1861, 382; Rep. Fis.-Nat. Cuba, ii, 1868, 406.—COPE, Trans. Am. Phil. Soc. 1870, 480.—GILL in Baird's Rep. Sea Fisheries of New England, 1873, 792.

Malthea vespertilio, CUV. & VAL., Hist. Nat. Poiss. xii, 1837, 440.—STORER, Syn. Fish. N. Amer. 1846, 131.—GILL, Cat. Fish. E. Coast N. Amer. 1861, 47.—LÜTKEN, Nat. Foren. Vid. Med. 1865, 5.

Malthœa vespertilio, DEKAY, New York Fauna, Fish, 1842, 452.

A single specimen of this species was noticed in the collection of Mr. John T. Bartram, of Stocks Point, Saint George's Island. It is recorded from various points in the West Indies. Dr. Günther has united all described species, except *Malthe cubifrons*, Richardson, under the name *Malthe vespertilio.* The species thus limited is very variable in respect to the length of snout, which in some individuals equals one-sixth of the entire length of the fish, in others reduced to one-twentieth or one twenty-fifth. Professor Lütken recognizes three species within these limits; *Malthe vespertilio*, represented by the synonymy given above;

Malthe longirostris, Cuv. & Val., the Guacucuja of Marcgrave;* and *Malthe notata*, Cuv. & Val. These species seem to correspond with certain limits of variation, and are probably entitled to subspecific rank, particularly since these limits of variation are correlated with their geographical distribution. The form designated as *vespertilio* corresponds to section (δ) of Günther, having the snout one-ninth or one-tenth of the total length, and is recorded from Cuba, Jamaica, Santo Domingo, Porto Rico, and Martinique.

M. longirostris corresponds to section (α) of Günther, having the snout one-sixth of the total length, and is recorded from Bahia and Para.

M. notata was described from Surinam, and, according to Dr. Günther, from young specimens. Dr. Günther identifies it with a Demerara specimen, and refers it to section (ε), having the snout one-thirteenth of the total length.

M. angusta, corresponding to section (η) of Günther, with the snout one-twentieth to one twenty-fifth of the total length, represents the minimum development of snout, and is known from Brazil.

Malthe cubifrons, Richardson, is undoubtedly entitled to full specific rank.

ANTENNARIIDÆ.

PTEROPHRYNE PICTA, (*Val.*) *Goode.*

DEVIL-FISH; MARBLED ANGLER.

Lophius histrio, var. *b*, *pictus*, SCHNEIDER, Bloch, Syst. Ichth. 1801, 124.
Chironectes pictus, CUV. & VAL., Hist. Nat. Poiss. xii, 293, pl. 364.
Antennarius marmoratus, var. *a*, *picta*, GTHR., Cat. Fish. Brit. Mus. iii, 1861, 186.

A single specimen was given me by C. C. Keane, esq., of Hamilton, and I saw several others. The fish is pelagic, occurring only in the warmer parts of the Atlantic. Its home is among the floating masses of Gulf-weed (*Sargassum bacciferum*). It is often brought ashore in the beds of this alga, which is thrown up among the rocks in great heaps after the winter storms. I have seen its curious nest, consisting of a bunch of eggs adhering in glutinous masses to the *Sargassum*, the whole cluster large enough to fill a quart measure. One of these was thrown ashore in February, and is now in the collection of J. Matthew Jones, esq., of Halifax, Nova Scotia.

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* Historia Naturalis Brasiliæ, 1648, p. 143.

DIODONTIDÆ.

PARADIODON HYSTRIX, (*Linné*) *Bleeker.*

SEA HEDGEHOG; SEA PORCUPINE.

Guamajacu Guara, MARCGRAVE, Hist. &c. Brazil. 1648, 158.

Diodon Hystrix, LINNÉ, Syst. Nat. ed. 10, 1, 1758, 335; ed. 12, 1, 1766, 413 (not Gmelin) Linné, Syst. Nat. 1, 1788, 449, according to BARNEVILLE, Revue zoologique 1846, 141).—POEY, Mem. ii, 1861, 361.—GÜNTHER, Cat. Fish. Brit. Mus., viii, 1870, 306.—COPE, Trans. Am. Phil. Soc. 1870, 480.

Paradiodon hystrix, BLEEKER, Atl. Ichth. v, 1865, tab. ccvii, f. 2.—POEY, Rep. Fis. Nat. Cuba, ii, 1868, 430.

Erizo, PARRA, Desc. Dif. Piez. Hist. Nat. Cuba, 1787, 60, lam. xxix, f. 1–2.

Diodon atinga, BLOCH, Ichth. iv, 1787, 75, taf. cxxv, (not Linné).—GMELIN, Linné, Syst. Nat. 1, 1788, 1449.—SCHNEIDER, Bloch, Syst. Ichth. 1801, 511.—LACÉPÈDE, Hist. Nat. Poiss. ii, 1801, 1–3.—SHAW, Gen. Zool. v, 1804, 434.—MÜLL. & TROSCH. in Schomburgk, Hist. Barbados, 1848, 677.—KAUP, Wiegmann's Arch. Naturg. xxi, 1855, 227.—JOUAN, Anim. Nouv. Caledonie, Mem. Soc. Imp. Sci. Nat. Cherbourg, 1861–'63, 18.—BLEEKER, Enum. Pisc. Arch. Ind. 1859, 203.

Diodon attinga, RUPPELL. Verzeichn. Senckenb. Mus. Fisch. 18 2, 35.

Diodon Plumieri, LACÉPÈDE, op. cit. ii, 1, 1801, 1-10, pl. iii, f. 3.

Diodon Brachiatus, SCHNEIDER, op. cit. 213 (founded on Parra's figure No. 1, cited above.)

Diodon punctatus, CUVIER, Mem. Mus. Hist. Nat. iv, 1818, 132, and Règne Animal, 1817, p.—. —BLEEKER, Verhandl. Bat. Gen. xxiv, Blootk. Vissch. 1852, 19.

This species, common in the West Indies, recorded also from the Pacific and the Indian Archipelago, is occasionally found here, and, on account of its bristly skin, is greatly prized by curiosity-hunters. It is never eaten. I saw four specimens, each about eighteen inches long.

CHILOMYCTERUS RETICULATUS, (*Linn.*) *Bibron.*

Orbis muricatus et reticulatus, WILLUGHBY, Ichthyographia, 1685, 155, tab. J, No. vii.—SEBA, Locup. Rer. Nat. Thes. Desc. iii, 1758, 58, tab. xxiii, f. 3.

Ostracion subrotundus, aculeis undique brevibus triquetris raris, ARTEDI, Gen. Pisc. 1738, 52, No. 16.

Diodon reticulatus, LINNÉ, Syst. Nat. 1, 1758, 334.—GMELIN, Linné, Syst. Nat. 1, 1788, 1449.

Chilomycterus reticulatus, BIBRON *apud* BARNEVILLE, Revue Zoologique, 1846, 141.—BLEEKER, Atl. Ichth. v, 1865, 54.—GÜNTHER, Cat. Fish. Brit. Mus. viii, 1870, 313.

Diodon atringa β, LINNÉ, op. cit. ed. 12, 1, 1766, 413.

? Diodon atinga, POEY, Mem. ii, 1861, 361; Rep. Fis. Nat. Cuba, ii, 1868, 429.—COPE, Trans. Am. Phil. Soc. 1870, 480.

Dr. Günther records a single specimen from the Bermudas. Another, in the University Museum at Middletown, Connecticut, is said to have come from the same locality.

Additional data are necessary in order to determine the true relations of Linné's *Diodon atringa* (*atinga*). Barneville and Bleeker consider it identical with *Diodon orbicularis* of Bloch. Günther does not commit himself decidedly, although he cites, under *Chilomycterus geometricus*, Marcgrave's *Guamajacu atinga*, upon which the species of Linné is presumably founded. The relations of the species *D. atinga* are important as throwing light upon the relations of the genus *Diodon*, of which it must be considered the type; there can be little doubt, however, that Bleeker is right is retaining in this genus those forms which have three rather than two roots to their spines.

TETRODONTIDÆ.

CHILICHTHYS SPENGLERI, (*Bloch*) *Goode.*

SWALLOW; PUFF-FISH.

Tetrodon Spengleri, BLOCH, Ichth. iv, 1787, 134, taf. cxliv.—SCHNEIDER, Bloch, Syst. Ichth. 1801, 504.—LACÉPÈDE, Hist. Nat. Poiss. i, 1798, 476–501.—SHAW, Gen. Zool. v, 1804, 445.—GÜNTHER, Cat. Fish. Brit. Mus. viii, 1870, 284.—COPE, Trans. Am. Phil. Soc. 1870, 479.

Tetrodon Plumieri, LACÉPÈDE, op. cit. 476–504, pl. xx, f. 3 (on a drawing by Plumier).

Tetrodon marmoratus, RANZANI, Nov. Comm. Acad. Bonon. iv, 1840, 72, pl. x, f. 1.—LOWE, Trans. Zool. Soc. ii, 1841, 193.—VALENCIENNES in Webb and Berthelot, Hist. Nat. Canaries, Poiss. 1836, pl. xx, f. 2.

A single specimen of two inches was found on the beach at Bayley's Bay. The species ranges from Madeira and Northwestern Africa to the Caribbean, and no doubt frequently occurs about the Bermudas. Bloch, in his description, figures the species with the imperforate nasal tentacles of the genus *Arothron*, giving the East Indies as its habitat. Making due allowances for the notorious carelessness of early ichthyologists in fixing the localities of specimens, and for the lack of detail in their drawings, we believe that the present name should be retained, since the fish figured by Bloch is unmistakably the one before us. Should time render it necessary to adopt another name, that of Ranzani, who described the species accurately, may be substituted.*

Color.—Above, light chestnut; beneath, clear white; a lateral band of tawny white, from chin to base of caudal rays, where it is confluent with a ring of the same color around the extremity of the caudal peduncle; beneath this lateral band a row of brown spots, of irregular size and fifteen in number, three being on the caudal peduncle; above a similar row, often very obscure. Caudal brown, with broad, median transverse band of yellow; other fins immaculate.

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* *Tetrodon marmoratus*, RANZANI, Novi Commentarii Acad. Sci. Inst. Bonon iv, 1840, p. 72, pl. x, fig. 1.

When inflated with air, the diameter of the belly is considerably greater than half the entire length of the fish.

Its habits are doubtless very similar to those of *Chilichthys turgidus* (Mitch.) Gill, common on the east coast of North America from Cape Cod to the Antilles, which it much resembles, and which is very likely to occur in the Bermuda waters.

OSTRACIIDÆ.

OSTRACIUM TRIQUETRUM, *Linn.*

CUCKOLD.

Ostracion triangulus, tuberculis, exiguis numeris aculeis carens, ARTEDI, Gen. Pisc. 1738, 57; Syn. Pisc. 1738, 85.

Ostracion polyodon inermis triqueter, LINNÉ, Mus. Ad. Fried. 1, 1754, 60.

Ostracion triqueter, LINNÉ, Syst. Nat. ed. 10, 1, 1758, 330; ed. 12, 1, 1766, 407.—BLOCH, Ichth. iv, 1787, 106, taf. cxxx.—GMELIN, Linné, Syst. Nat. 1, 1788, 1441.—SCHNEIDER, Bloch, Syst. Ichth. 1801, 498.—LACÉPÈDE, Hist. Nat. Poiss. 1, 444.—SHAW, Gen. Zool. v, 1804, 420.—MÜLL. & TROSCH. in Schomburgk, Hist. Barbados, 1848, 677.—HOLLARD, Ann. Sci. Nat. 1857, 154.—GÜNTHER, Cat. Fish. Brit. Mus. viii, 1870, 256.

Ostracion triquetrum, POEY, Mem. ii, 1861, 361; Rep. Fis.-Nat. Cuba, ii, 1868, 442.

Ostracium triquetrum, COPE, Trans. Am. Phil. Soc. 1870, 475.

Rhinesomus triqueter, SWAINSON, Nat. Hist. Fish. & Rept. ii, 1839, 324.

Common, as it also is throughout the West Indies and the Gulf of Mexico. Its length seldom exceeds eight inches. Its habits are sluggish, and it hugs very closely the bottom, where it is frequently taken in fish-pots.

The locomotion of the trunk-fishes is very peculiar, and I found an excellent opportunity for observing the movements of a Cuckold confined in my aquarium. The propelling force is exerted by the dorsal and anal fins, which have a half-rotary, sculling motion resembling that of a screw-propeller; the caudal fin acts as a rudder, save when it is needed for unusually rapid swimming, when it is used as by other fishes. The chief function of the broad pectorals appears to be that of fanning a current of water through the gills, thus aiding respiration, which would otherwise be difficult on account of the narrowness and inflexibility of the branchial apertures.

When taken from the water, one of these fishes will live for two or three hours, all the time solemnly fanning its gills, and when restored to its native element seems none the worse for its experiences, except that, on account of the air absorbed, it cannot at once sink to the bottom. The Cuckold is not valued for food, though I am unable to learn that its use is ever followed by fatal results such as attend it in some of the West Indies.*

The local name is not applicable, and has probably been transferred from some other fish, as, for instance, the following species, which is known in Jamaica as "the cuckold."

Color.—Dark brown, thickly studded with circular spots of yellowish-white, each about two lines in diameter. The epidermis is often abraded, leaving the shell uniform tawny-white.

OSTRACIUM QUADRICORNE, *Linné.*

COW-FISH.

Piscis triangularis cornutus Clusii, Willughby, Hist. Pisc. 1686, xiv, tab. J.

Ostracion triangularis 2 aculeis &c., Artedi, Syn. Pisc. 1738, 85, No. 9.

Ostracion quadricornis, Linné, Syst. Nat. ed. 10, 1, 1758, 331; ed. 12, 1, 1766, 408.—Bloch, Ichth iv, 1787, 113, taf. cxxxiv.—Gmelin, Linné, Syst. Nat. 1, 1788, 1442.—Schneider, Bloch, Syst. Ichth. 1801, 499.—Lacépède, Hist. Nat. Poiss. 1, 1798, 442, 468.—Shaw, Gen. Zool. v, 1804, 424.—Kaup, Wiegmann's Arch. Naturg. xxi, 1855, 218.—Hollard, Ann. Sci. Nat. 1857, 148.—Bleeker, Poiss. Guinea, 1863, 20.—Günther, Cat. Fish. Brit. Mus. viii, 1870, 258.

Ostracion quadricorne, Poey, Mem. ii, 1861, 362; Rep. Fis.-Nat. Cuba, ii, 1868, 439.

Ostracion (Acanthostracion) quadricornis, Bleeker, Atl. Ichth. 1865, 32.

Ostracium quadricorne, Cope, Trans. Am. Phil. Soc. 1870, 474.

Lœtophrys quadricornis, Swainson, Hist. Nat. Fish. & Rept. ii, 1839, 324.

Chopin, Parra, Desc. Dif. Piez. Hist. Nat. Cuba, 1787, 31, lam. xvii.

Ostracion Lister, Lacépède, op. cit. 468, pl. xxiii, f. 2.

Ostracion sexcornutus, Mitchill, Amer. Month. Mag. ii, 1818, 328.

Lactophrys sexcornutus, Storer, Syn. Fish. N. Am. 1846, 246.

Ostracion cornutus, Müll. & Trosch. in Schomburgk, Hist. Barbados, 1848, 677 (not Linné or Bloch).

Ostracion maculatus, Hollard, op. cit. 149.

Common; its habits much like those of *Ostracium triquetrum.* Its range is much wider, including Saint Helena, Guinea, the Cape of

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* Schomburgk, History of Barbados, p. 677.

Good Hope, and Charleston, S. C. Its occurrence in the Indian Archipelago is extremely doubtful, as Bleeker himself admits. This species is extremely variable, in length, breadth, and height of body, length of tail, and length of caudal, and these variations seem to be individual as well as related to age. Hollard's *Ostracion maculatus* [*] and the various *species dubia* of Poey [†] will probably prove to be forms of this species.

The presence of plates upon the caudal peduncle is apparently accidental. They may possibly have some relation to sex, but certainly none to age. Out of fourteen specimens examined, five had plates above and below, one had two above, and six had none. In none of the specimens can I distinguish traces of the spine in the middle of the dorsal ridge mentioned by Dr. Günther. The color of young specimens is well described by Günther; the bands on the check are, however, of a bright blue. Adult specimens are colored in a rich bright blue, which quickly vanishes after death. In some individuals, the color is worn from the ridges of the carapace, leaving patches of light brown. The largest specimens are twenty-one inches long.

The Cow-fish is, I was told, much esteemed for food, and is frequently baked whole in its shell. The popular name, like the Cuban "*toro*" and the Jamaican "cuckold," refers to the two horn-like supra-orbital spines.

BALISTIDÆ.

BALISTES CAPRISCUS, *Gmelin*.

TURBOT.

Balistes capriscus, GMELIN, Linné, Syst. Nat. 1, 1788, 1471.—SCHNEIDER, Bloch, Syst Ichth. 1801, 476.—LACÉPÈDE, Hist. Nat. Poiss. 1798, 1, 372, pl. xiii, f. 3.—SHAW, Gen. Zool. v, 1804, 411—RISSO, Ichth. Nice, 1810, 51.—YARRELL, Brit Fish. ii, 1841, 472.—HOLLARD, Ann. Sci. Nat. 1854, 309.—GÜNTHER, Cat. Fish. Brit. Mus. viii, 1870, 217.—GILL, in Baird's Rep. on Sea Fisheries of Southern New England, 1873, 793.

Balistes fuliginosus, DEKAY, New York Fauna, Fishes, 1842, 339, pl. lvii, f. 188.—STORER Syn. Fish. N. Am. 1846, 243.

Capriscus fuliginosus, GILL, Cat. Fish. E. Coast N. Am. 1861, 56.

Common. Very erratic in its distribution, having been observed in the Pacific at Panama, at Madeira, in the Mediterranean, and on the coast of Great Britain. DeKay figures a specimen taken in New York Harbor; the

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[*] Annales des Sciences Naturelles, vii, p. 148.

[†] Repertorio Fisico-Natural de la Isla de Cuba, ii, pp. 439-440.

United States National Museum has specimens from Wood's Hole, Mass., Charleston, S. C., and the Tortugas; it is not recorded from the West Indies. The Turbot attains a weight of five or six pounds; its flesh is not unpalatable, and its tough, shagreen-like skin is used for polishing purposes. It has a habit of swimming on its side, just at the surface, like the Sunfish (*Mola rotunda*), and, from this habit as well as perhaps a fancied similarity of its form to that of the European Turbot (*Rhombus maximus*), its name appears to have been derived. It no doubt breeds in these waters; I have seen young individuals not exceeding three inches in length. The species should be compared with *Balistes sobaco*, Poey. No other species of this subfamily were observed.

I suppose the "Old-wife," "Ocean-turbot," and "Black-turbot" of the fishermen to correspond respectively to *Balistes vetula*, Linné, *Canthidermis maculatus*, (Gmelin) Bleeker, and *Melichthys bunira* (Lacépède), all of which, as well as *Balistes ringens*, Linné, are quite certain to occur in these waters.

ALUTERA SCRIPTA, (*Osbeck*) *Bleeker*.

Unicornis Piscis Bahamensis, Catesby, Nat. Hist. Carol. Florida, and the Bahama Islands, ii, 1743, 19, tab. 19.

Balistes scriptus, Osbeck, Iter. Sin. 1765, 144.—Gmelin, Linné, Syst. Nat. 1, 1788, 1463.

Aluteres scriptus, Bleeker, Ned. Tyds. Dierk. iii, 1865, 28; Ichth. 1865, 141, tab. ccxxvii, 4.

Monacanthus scriptus, Günther, Cat. Fish. Brit. Mus. viii, 1870, 252.

Lija Trompa, Parra, Desc. Dif. Piez. Hist. Nat. Cuba, 1787, 46, lam. xxii, f. 1.

Balistes Lævis, Bloch, Ichth. xii, 1797, 63, tab. ccccxiv.—Shaw, Gen. Zool. v. 1804, 405.

Aluterius lævis, Cuvier, Règne Animal, 1817.—Cantor, Cat. Malayan Fish. 355.—Bleeker, Verhandl. Batav. Gen. xxiv (Balistidæ), 21.—Hollard, Ann. Sci. Nat. 1855, 15.—Day, Fish. Malabar, 1865, 355.

Alutera lævis, Swainson, Nat. Hist. Fish. & Rept. ii, 1839, 327.

Aleuteres lævis, Richardson, Voy. H. M. S. Sulphur, 1845, 131, pl. lxi, f. 3.

Balistes Monoceros, var. *Lævis*, Schneider, Bloch, Syst. Ichth. 1801, 463.

Balistes ornatus, Procé, Bull. Philom. 1822, 131.

Aluteres pareva, Lesson, Voy. Coquille, ii, 1830, 106.

Aluterus venosus, Hollard, op. cit. 14, pl. 1, f. 3.

Alutera picturata, Poey, Proc. Acad. Nat. Sci. Phila. 1863, 183; Rep. Fis.-Nat. Cuba, ii, 438.

Aleuteres picturatus, Cope, Trans. Am. Phil. Soc., 1870, 476.

A specimen twenty-one inches long was taken off the islands in April, 1872. The occurrence of the species is so unusual that it has no common name. It appears to be strictly pelagic, and is recorded from China, the Indian Archipelago, Tahiti, New Ireland, Coromandel, the Canaries, the West Indies, Brazil, and South Carolina.

HIPPOCAMPIDÆ.

HIPPOCAMPUS, *sp.*

SEA-HORSE.

Two specimens, apparently of different species, were secured; but, owing to the unsatisfactory nature of the published descriptions, it is impossible at present to identify them. One agrees tolerably with *H. antiquorum*, Leach.

SYNGNATHIDÆ.

SYNGNATHUS JONESII, *Günther.*

Syngnathus Jonesii, GÜNTHER, Ann. & Mag. of Nat. Hist. 1874.

This species was deservedly dedicated to J. Matthew Jones, esq., F. L. S., who is doing so much toward elucidating the natural history of these islands. Pipe-fishes are not uncommon. *S. pelagicus*, Osbeck, is likely also to occur.

AULOSTOMIDÆ.

AULOSTOMA MACULATUM, *Valenciennes.*

TRUMPET-FISH.

Trompetero colorado, PARRA, Descr. Dif. Piez. Hist. Nat. Cuba, 1787, 63, lam. xxx, f. 2.

Aulostoma maculatuus, VALENCIENNES in Cuvier, Règne Animal, 1817; ill. ed. Poiss. 1829, pl. xcii, f. 2.

Aulostoma coloratum, MÜLL. & TROSCH. in Schomburgk's Hist. Barbados, 1848, 173.—GÜNTHER, Cat. Fish Brit. Mus. iii, 1861, 536.—POEY, Rep. Fis.-Nat. Cuba, ii, 1868, 386.—COPE, Trans. Am. Phil. Soc. Phila. 1870, 480.

A dried head of this species was shown me by C. C. Keane, esq., of Hamilton. The fishermen speak of two Trumpet-fishes found here, one of them designated the Black Trumpet-fish. One of these is probably *Fistularia tabaccaria*, Linné. Mr. J. Matthew Jones informs me of the capture, in 1874, of a specimen of *Fistularia serrata*, Cuv., hitherto known only from the Indian and Pacific Oceans.

FIERASFERIDÆ.

LEFROYIABERMUDENSIS, *Jones.*

Lefroyia Bermudensis, JONES, Zoologist, Jan., 1874, 3838.

A single specimen four and one-half inches long was taken by Governor Lefroy in the summer of 1873.

"Total length rather more than 4½ inches. Greatest depth at the vertical of the pectorals, three lines and one-half. The length of the head is slightly more than one-seventh of the total length. The greatest width of the head is rather less than one-third of its length. Body naked, attenuate, compressed. Facial outline rugose. Eye moderate; horizontal diameter of the eye-cup, one and three-quarter lines; vertical diameter, one and one-quarter lines. Gape of mouth wide. Lower jaw shorter, and received within the upper. Cardiform teeth of irregular size in both jaws, vomer, and palatines; those of the latter largest. Branchiostegals seven, inflated, united below. Vent thoracic. Pectorals originating at the upper angle of the operculum, three lines in extent, of delicate soft rays. Dorsal indistinct, commencing in a groove at about the vertical of the twentieth anal ray, continuous to caudal extreme; when in conjunction with the anal, it forms a small filamentous tip. Anal prominent, commencing immediately behind the vent, in advance of the vertical to the upper angles of the operculum, and extending to the caudal extreme. About its centre, it is equal in depth to that of the body at the same position. Owing to the delicate texture of the fins, it is impossible to determine the number of rays, but those of the anal exceed one hundred and forty. Color when dried, out of spirit, golden-yellow. The body transparent, showing the vertebra within, a condition, according to General Lefroy, equally observable in life."—*Jones.*

The genus proposed by Mr. Jones has not yet been defined, and the name *Lefroyia* can be adopted only provisionally.

BLENNIIDÆ.

LABROSOMUS NUCHIPINNIS, (*Quoy & Gaimard*) *Poey.*

MOLLY MILLER.

Clinus nuchipinnis, QUOY & GAIMARD. Voy. Uranie et Physicienne, Zool. 1824, 255.—GÜNTHER, Cat. Fish. Brit. Mus. iii, 1861, 262.

Labrosomus nuchipinnis, POEY, Rep. Fis.-Nat. Cuba, ii, 1868, 308.

Clinus pectinifer, CUV. & VAL., Hist. Nat. Poiss. xi, 1836, 374 (female).—MÜLL. & TROSCH. in Schomburgk's Hist. Barbados, 1848, 671.—CASTELNAU, Anim. Nouv. &c. Amérique du Sud, 1855, Poiss. 26.

Labrisomus pectinifer, SWAINSON. Nat. Hist. Fishes &c. 1839, 277.—COPE, Trans. Am. Phil. Soc. 1870, 473.

Labrosomus pectinifer, GILL. Proc. Acad. Nat. Sci. Phila. 1860, 105.—POEY, Mem. Hist. Nat. Cuba. ii, 1861, 381.

Clinus capillatus. CUV. & VAL., op. cit. 377 (male).—MÜLL. & TROSCH., l. c.

Labrisomus capillatus, SWAINSON, l. c.

Labrosomus capillatus, GILL, op. cit. 107.—POEY, l. c.

Lepisoma cirrhosum, DEKAY, New York Fauna, Fishes, 1842, 41, pl. xxx, f. 94.—STORER. Syn. Fish. N. Am. 49.

Very common under stones in tide-pools and in crevices; their habits closely resembling those of the "Rock-eel" (*Murænoides mucronatus*), so familiar to naturalists on the New England coast. Some individuals are brilliantly colored with red beneath, while others are gray. These differences are most probably sexual. My largest specimens are four inches long. The species is recorded from the Antilles, Bahia, Gorea, and the National Museum has specimens from Florida.

SALARIAS TEXTILIS, *Q. & G.*

Salarias textilis, QUOY & GAIMARD, MS.—CUVIER & VALENCIENNES, Hist. Nat. Poiss. xi, 307.

? *Salarias vomerinus*, CUV. & VAL., op. cit. 349.

Salarias vomerinus (CUV. & VAL. ?) JENYNS, Zool. Voy. H. M. S. Beagle, Fishes, 1842, 88, pl. 17, f. 3.

This species, found in tide-pools in company with the preceding, appears to be identical with that brought by Quoy and Gaimard from the Isle of Ascension. The measurements do not agree precisely with those given by Valenciennes (which are expressed in very general terms); its colors, however, are precisely the same. It agrees in many points with the specimens collected by Darwin at Porto Praya, and provisionally referred by Jenyns to *Salarias vomerinus*, C. & V.

The Bermuda specimens have the vomerine teeth and the four ventral rays, the omission of which in the description of *Salarias textilis* was Jenyn's chief reason for not referring the Cape Verde specimens to that species. The affinities of *S. textilis* and *S. vomerinus*, always considered close, have some light thrown upon them by the discovery of vomerine teeth in the former. The question of their identity, however probable it may seem, must be decided by the comparison of a larger series of specimens. Such study will probably result in the establishment of a new genus for the reception of the species at present referred to *Salarias*, which possess vomerine teeth.

A detailed description of the Bermuda specimens is given for convenience in future comparisons. The greatest height of the body, at the beginning of the dorsal, is slightly less than one-sixth (0.16) of the extreme length, and is four-fifths of the length of the head; the height of the lowest part of the caudal peduncle equals one-half the greatest height of the body (0.08). The head measures one-fifth (0.20) of total length. The eye is slightly elliptical, and its longitudinal diameter equals the length of the snout, or one twenty-fifth (0.04) of the total length. The interorbital space equals half the diameter of the orbit, and is concave. The profile is very obtuse, and the eye is situated just within the angle formed by profile and crown. There are two broadly-palmated superciliary filaments, not so long as the diameter of the orbit; two similar but smaller ones at the nostrils; also two short filaments, one on either side of the nape. The lips are crenated at the sides of the mouth, though not anteriorly. In addition to the row of numerous small movable teeth common to all the species of the genus, there is a long recurved canine tooth on each side of the lower jaw, behind the series of small teeth; also, a transverse row of minute teeth on the anterior portion of the vomer.

The dorsal fin originates just behind the nuchal filaments, at a distance from the snout (0.22) slightly greater than the length of the head; its spinous portion nearly equals its soft portion, the former measuring 0.30, the latter 0.31. A deep notch almost separates the two parts.

The anal fin originates at a distance from the snout equal to one-half the length of the body exclusive of the caudal (0.42). Its first ray measures 0.07, its penultimate ray 0.12, its ultimate ray 0.05. The caudal is four twenty-fifths (0.16) of the total length, and is slightly rounded at the extremity. The pectorals equal the head in length (0.20), and barely reach to the vent. The distance from the snout to the upper axilla of the pectorals equals the distance to the origin of the ventrals, and also the length of the ventrals (0.11).

The lateral line is faintly indicated by a delicate line, arching above the pectorals, then running straight along the middle.

The radial formula is as follows:—D., XII–15; A., II, $15\frac{1}{1}$; C., 3–6–5–3; P., 14; V., I–4.

The color is greenish above, becoming white beneath. Twelve or fourteen brownish-violet cross-bands, arranged in pairs, and in part interrupted by three series of whitish dots, so as to form a row of quadrate blotches just above the lateral line. The third row of white dots is more pronounced, the dots becoming short lines, and is situated on the lateral line; a fourth series, less pronounced, may be seen near the lower edge of the body.

A Y-shaped figure of brown upon the chin, the arms extending forward, and three other fine brown lines on each side of the throat, extending transversely upward and backward, continued upon the cheek and opercle by lines of fine brown dots. A row of similar dots may be seen a little below the base of the anterior part of the dorsal. The fasciæ upon the sides extend on the dorsal, where they take an oblique direction backward. They are most pronounced at the base of the dorsal, forming a series of squares at the point of its junction with the body. The caudal has five or six irregular vertical lines. The anal is pale at its base, the tips of the rays dark brown, pectorals and ventrals dusky.

Measurements.

Extreme length, $0^{m}.062$	1.00
Body: Greatest height	.16
Head: Length	.20
Greatest width	.14
Length of snout	.04
Width of interorbital area	.02
Eye: Diameter	.04
Dorsal (spinous): Distance from snout	.22
Length of base	.31
Greatest height	.08
(soft): Length of base	.30
Greatest height	.31
Anal: Distance from snout	.42
Height at first ray	.11
Height at last ray	.05
Pectoral: Distance from snout at axilla	.11
Length	.20
Ventral: Distance from snout	.11
Length	.11

TRIGLIDÆ.

DACTYLOPTERUS VOLITANS, (*Linné*) *Cuv.*

Pirapebe or *Miivipira*, MARCGRAVE, Hist. &c. Brasil, 1648, 162.

Trigla volitans, LINNÉ, Syst. Nat. ed. 10, 1, 1758, 302; ed. 12, 1, 1766, 498.—GMELIN, Linné, Syst. Nat. 1, 1788, 1346.—BLOCH, Ichth. x, 1797, 93, taf. cccli.—SCHNEIDER, Bloch, Syst. Ichth. 1801, 12.—SHAW, Gen. Zool. iv, 622, pl. xci.

Dactylopterus volitans, CUV. & VAL., Hist. Nat. Poiss. iv, 1829, 117.—DEKAY, New York Fauna, Fish. 1842, 49, pl. xvii, f. 46.—MÜLLER & TROSCHEL, Schomburgk, Hist. Barbados, 1848, 667.—GUICHENOT, Explor. Scient. Algérie, Rept. & Poiss. 1850, 41.—CASTELNAU, Anim. Nouv. &c. Amérique du Sud, Poiss. 1855, 26.—POEY, Mem. ii, 1861, 367; Rep. Fis.-Nat. Cuba, ii, 1868, 304.—GILL, Cat. Fish. E. Coast N. Am. 1861, 43; Baird's Rep. on Sea Fisheries of Southern New England, 1873, 799.—GÜNTHER, Cat. Fish. Brit. Mus. ii, 1861, 222.—BAIRD, Rep. on Sea Fisheries of Southern New England, 1873, 824.

Morcielago, PARRA, Descr. Dif. Piez. Hist. Nat. Cuba, 1787, 25, lam. xiv.

Polynemus sexradiatus, MITCHILL, Amer. Month. Mag. 1818, 323 (figured as "The Six-rayed Polyneme," Trans. Lit. & Phil. Soc. N. Y. 1815, pl. iv. f. 10).

Dactylopterus communis, OWEN, Descr. Cat. Ost. Series, Roy. Soc. Surg. 1, 1853, 56.

Gonocephalus macrocephalus, GRONOW, Cat. Fish. (1780), ed. Gray, 1854, 106.

Rare and without a common name. The Colonial Museum at Hamilton and Mr. Bartram's collection at Saint George's each contain a dried specimen. Mr. Jones secured one in Hamilton Harbor in October, 1851.

The species ranges from Newfoundland to Rio de Janeiro, throughout the West Indies, and to the Cape Verde Islands, and the Mediterranean, where it is comparatively common.

SCARIDÆ.

SCARUS RADIANS, *Valenciennes*.

SPANISH PORGY.

Scarus radians, CUV. & VAL., Hist. Nat. Poiss. xiv, 1839, 207.—STORER, Syn. Fish. N. Am. 1846, 147.—GÜNTHER, Cat. Fish. Brit. Mus. iv, 1862, 207.—GUICHENOT, Mem. Soc. Imp. Sci. Nat. Cherbourg, 1865, 10.—COPE, Trans. Am. Phil. Soc. 1870, 462.

Labrus radians, CASTELNAU, Anim. Nouv. &c. Amérique du Sud, 1855, 29.

Common, occurring in large schools. The greatest length observed was eight inches. Though seined in quantity, the Spanish Porgies are not eaten, their flesh, like that of the other members of this family, being dry and flavorless. .

The species is recorded from Bahia, Mexico, and Saint Martin's. Specimens from Barbados and Jamaica are in the National Museum. Bermuda appears to be the northern limit of its range.

Color.—Above, olive, tinged with reddish-brown ; beneath, rose-color; head, upper part of body, and dorsal marbled with brown ; caudal irregularly banded with black, the extremity and spots on the membrane white; anal immaculate (in six specimens); base of pectorals black ; chin white.

PSEUDOSCARUS VETULA, (*Schneider*) *Gill*.

MUD FISH.

Vieja, PARRA, Descr. Dif. Picz. Hist. Nat. Cuba, 1787, 58, lam. 28. fig. 1.

Scarus vetula, BLOCH-SCHNEIDER, Syst. Ichth. 1, 1801, 289 (description founded on Parra's figures).—CUV. & VAL., Hist. Nat. Poiss. xiv, 1839, 193.—STORER, Syn. Fish. N. Amer. 145.—MÜLLER & TROSCHEL in Schomburgk's History of Barbados, 1848, 674.—COPE, Trans. Am. Phil. Soc. 1870, 461.

Pseudoscarus vetula, GILL, MS.

Scarus superbus, POEY, Mem. Hist. Nat. Cuba, ii, 1860, 218.

Pseudoscarus superbus, GÜNTHER, Cat. Fish Brit. Mus. iv, 1862, 218.—POEY, Rep. Fis.-Nat. Cuba, ii, 1868, 346.

Pseudoscarus psittacus, GÜNTHER, op. cit. 225.

The Mud-fish is very common, its gorgeous colors making it very conspicuous as it swims. The young may be seen by the hundred in the shallow rock-pools, while in the deeper waters the larger fish are sailing about with the precision and regularity of a squadron of cavalry under drill. Though its flesh is not unpalatable, this fish is not often brought to market; the enormous scales are much used in fancy work. The species is recorded from several Antilles.

The young fish differ much from the adult in coloration, their markings closely approximating those of *Pseudoscarus sanctæ-crucis* (Schn.) Gthr. Since no specimens of the latter species measuring more than eight or nine inches are on record, and none of *P. vetula*, in adult coloring, less than eighteen inches in length have fallen under my observation, it seems possible that the two species may be the same in different stages of growth, particularly since both are usually recorded from the same locality. The question of their identity may be easily decided by the Bermudian naturalists.

As is indicated in the synonymy, *vetula* is the specific name properly belonging to this species. Parra (l. c.) gives an excellent figure of the fish under the name *Vieja*, and on this figure Schneider founded his *Scarus vetula*, the specific name being a translation of Parra's *Vieja*. Of this fact, Valenciennes was aware, and by it he was guided in adopting the name of Schneider. Professor Poey renamed the species with the remark: "C'est à tort que M. Valenciennes rapport la figure de Parra au *Sc. vetula*," seemingly forgetful that Schneider's name was founded not upon specimens, but upon Parra's figure solely. Dr. Günther, adopting the views of Prof. Poey, cites *Scarus vetula* as a synonym of *Pseudoscarus psittacus*, (Linn.) Gthr.

PSEUDOSCARUS CÆRULEUS, (*Bloch*) *Günther*.

"CLAMACORE" OR "KILMAGORE."

Novacula cærulea, CATESBY, Nat. Hist. Carolina, Florida and the Bahama Islands, ii, 1743, 18, pl. 18.

Coryphæna cærulea, BLOCH, Ichth. v, 120.—GMELIN, Linné, Syst. Nat. 1, 1788, 1791.

Scarus cæruleus, SCHNEIDER, Bloch, Syst. Ichth. 1, 1801, 288.

Pseudoscarus cœruleus, GÜNTHER, Cat. Fish. Brit. Mus. iv, 1862, 227.—GUICHENOT, Proc. Soc. Imp. Sci. Nat. Cherbourg, 1865, 24.—POEY, Rep. Fis. Nat. Cuba, ii, 1861, 348.

Trompa, PARRA, Descr. Dif. Piez. Hist. Nat. Cuba, 1787, 57, lam. xxvii, f. 2.

Loro, PARRA, l. c. f. 1.

Scarus loro, SCHNEIDER, op. cit. 288.

Scarus trilobatus, LACÉPÈDE, Hist. Nat. Poiss. iv, 1803, 21.

Sparus holocyanosus, LACÉPÈDE, op. cit. 45.

The "Clamacore" or "Kilmagore" is very unusual in Bermudian waters; a single specimen of thirty-six inches was taken outside the reefs in April, 1872, and was an object of much curiosity. The color in life was brilliant turquoise-blue, fading to olive-green in alcohol. The species is recorded from Cuba and some of the adjoining islands.

Dr. Günther suggests that this species is probably only the adult stage of one of the other species, such as *Pseudoscarus chloris*,* but an examination of specimens has convinced me that this is not the case. In the National Museum are two well-characterized specimens of *Pseudoscarus cæruleus*, measuring nine and fifteen inches respectively, both of which have the hump upon the profile well developed, though not so prominent as in the adult specimen of thirty-six inches. Parra's two figures (lamina xxviii) named "Loro" and "Trompa" represent different ages of this species, the prolonged caudal lobes as well as the additional size of the caudal lobe being characters of age.

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* The study of the synonymy of this species has brought to light an error, which may be referred to here. It appears that Parra's *Vieja*, No. 3, and Schneider's *Scarus chloris*, founded upon the figure of Parra, belong, not to *Pseudoscarus*, as is intimated by Dr. Günther, but to *Scarus*; such is the judgment of Professor Poey after consulting the type of Parra's description, preserved in the Museum in Madrid. M. Guichenot, after an examination of the types in the Musée d'Histoire Naturelle, Paris, retains in this genus *Scarus virens*, Valenc. There now remains only *Scarus quadrispinosus*, Val., as a synonym of Günther's *Pseudoscarus chloris*, and, of these names, that of Valenciennes has undoubted priority. The reversed synonymy should stand then somewhat as follows:—

SCARUS CHLORIS, *Schn.*

Vieja, PARRA, Descr. Dif. Piez. Hist. Nat. Cuba, 1787, 59, lam. 28, f. 3.

Scarus chloris, SCHNEIDER, Bloch, Syst. Ichth. 1801, 289 (on Parra's figure).—COPE, Trans. Am. Phil. Soc. 1870, 461.

Pseudoscarus chloris, GÜNTHER, Cat. Fish. Brit. Mus. iv, 1862, 227.

Scarus virens, CUV. & VAL., Hist. Nat. Poiss. xiv, 1839, 203.—STORER, Syn. Fish. N. Am. 1846, 146.—MÜLLER & TROSCHEL in Schomburgk's Hist. Barbados, 1848, 674.

Scarus chrysopterus, SCHNEIDER, op. cit. 286. pl. lviii.—CUV. & VAL., op. cit. 185.—STORER, op. cit. 143.—COPE, op. cit. 462.

Scarus lateralis, POEY, Mem. Hist. Nat. Cuba, 1860, ii, 219; Rep. Fis. Nat. 1, 1867, 337, 375.

HABITAT.—Cuba, Santa Cruz, Saint Christopher's, Saint Thomas, Martinique, Porto Rico, Barbados.

PSEUDOSCARUS QUADRISPINOSUS, (*Valenc.*) *Guichenot.*

Scarus quadrispinosus, CUV. & VAL., Hist. Nat. Poiss. xiv, 1839, 197.—STORER, Syn. Fish. N. Am. 1846, 144.

Pseudoscarus quadrispinosus, GUICHENOT, Proc. Soc. Imp. Sci.-Nat. Cherbourg. 1865, 27.

? *Scarus obtusus*, POEY, Mem. Hist. Nat. Cuba, ii, 1860, 217; Rep. Fis.-Nat. ii, 1868, 349.

Pseudoscarus chloris (not Bloch), GÜNTHER, Cat. Fish. Brit. Mus. iv, 1862, 227.—COPE, Trans. Am. Phil. Soc. 1870, 461.

HABITAT.—Saint Thomas, Cuba, Jamaica, Bahamas.

LABRIDÆ.

CHŒROJULIS RADIATUS, (*Linné*) *Goode.*

BLUE-FISH.

Turdus Oculo radiato (Pudding-wife), CATESBY, Nat. Hist. Carol. & B. 1743, ii, 12, tab. xii, fig. 1.

Sparus radiatus, LINNÉ, Syst. Nat. ed. 12, 1, 1776, 472.—GMELIN, Linné, Syst. Nat. 1, 1788, 1278.

Doncella, PARRA, Desc. Dif. Piez. Hist. Nat. Cuba, 1787, 95, lam. xxxvii, fig. 1.

Julis cyanostigma, CUV. & VAL., Hist. Nat. Poiss. xii, 1839, 391 (type 6 inches long).—MÜLL. & TROSCH. in Schomburgk's Hist. Barbados, 1848, 673.—STORER, Syn. Fish. N. Am. 1846, 139.

Platyglossus cyanostigma, GÜNTHER, Cat. Fish. Brit. Mus. iv, 1862, 161.—COPE, Trans. Am. Phil. Soc. 1870, 464.

Chœrojulis cyanostigma, POEY, Rep. Fis. Nat. Cuba, ii, 1868, 334.

Julis Principis, CUV. & VAL., op. cit. 402, (type 11 inches long).—STORER, op. cit. 140,

Platyglossus principis, GÜNTHER, op. cit. 164.

Julis patatus (partim), CUV. & VAL. op. cit. 398 (types 13 to 15 inches long).—STORER op. cit. 140.

The Blue-fish is frequently taken in the pots, though not valued as food. My largest specimen measures sixteen inches. The common name refers to the color of the adult fish. The species is recorded from several of the West India islands.

Color.—In the adult, a brilliant azure-blue, each scale edged with bright pearly-green. A longitudinal band on anal and the margin of the dorsal light blue. In the young, the prevailing hue is brownish, a large light-blue spot on the base of each scale. Head with spots and longitudinal stripes of light blue. Dorsal with broad margin, and four lines of spots and blotches, longitudinally arranged, of the same color. Caudal with broad white margin, outer rays blue to the extremity, the base of the fin thickly spotted with the same. Anal with border and two longitudinal lines of blue, the fin being thus divided into three nearly equal parts, a large circular spot of the same color at the base of each ray except the first. Pectoral with the first five rays and a narrow transverse line across the base from the fourth ray blue.

My notes on the colors of young and adult specimens of this species have led me to believe that the different ages have been described under several different specific names, as the synonymy given above would indicate. *Julis cyanostigma* was the name given by Cuvier and Valenciennes to specimens six inches in length, *Julis principis* to those of eleven inches, while those ranging from thirteen to fifteen inches are included under *Julis patatus.* The specimens of larger size ("*Vindividus à plus de quinzes pouces*"), included under the latter name, probably belong to another species. The 'Mudian fishermen recognize the difference in color to be caused by age.* I have seen specimens with the colors of immaturity, which had attained the length of ten inches. It will probably be found that the change of color is not restricted to any fixed period in the growth of the fish. Should farther investigations sustain the opinion of Dr. Günther† that Linné's *Sparus radiatus* is a different species from that figured by Catesby, the specific name *cyanostigma* should be retained.

LACHNOLÆMUS FALCATUS, (*Linné*) *Val.*

HOG-FISH.

Suillus (Great Hog-fish), CATESBY, Hist. Carol. Florida and the Bahama Islands, ii, 1743, 135, tab. xv.

Labrus falcatus, LINNÉ. Syst. Nat. ed. 10, 1, 1758, 284; ed. 12, 1. 1766, 475.—GMELIN, Linne, Syst. Nat. ed. 1, 1788, 1287.—LACÉPÈDE, Hist. Nat. Poiss. &c. iii, 1803, 425, 463.

Lachnolaimus falcatus, CUV. & VAL., Hist. Nat. Poiss. xiii, 276.—GÜNTHER, Cat. Fish. Brit. Mus. iv, 1862, 87.—POEY, Rep. Fis.-Nat. Cuba, ii, 1868, 330.—COPE, Trans Am. Phil. Soc. 1870, 464.

Lachnolaimus aigula, CUV. & VAL., op. cit. 277, tab. 388 (type 11 inches long).—STORER, Syn. Fish. N. Am., 136.

Lachnolaimus dux, CUV. & VAL., op. cit. 285 (type 8 inches long).—STORER, l. c.

Lachnolaimus suillus, CUV. & VAL., op. cit. 286 (type 24 inches long).—STORER, l. c.

Lachnolaimus caninus, CUV. & VAL., op. cit. 288 (type 10 inches long).—STORER, l. c.

Lachnolaimus psittacus, CUV. & VAL., op. cit. 291.—STORER, l. c.

Very common here, as it is throughout the West Indies. Hog-fish

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* Since the above was written, I find that very similar conclusions have been reached by Professor Poey, who gives under *Charojulis cyanostigma* a synonymy much like the above.

† Cat. Fish. Brit. Mus. iv, p. 164, note.

Ledge, at the entrance to Hamilton Harbor, is marked by a pyramid of stone, called the "Hog-fish Beacon," which is surmounted by a huge iron image of a Hog-fish.

The long streamer-like appendages or continuations of the vertical fins give to the Hog-fish as it swims a singularly graceful appearance. The beauty of those exposed in the market is frequently marred, however, by having had these ornaments bitten off by the craw-fish and lobsters confined with them in the wells of the boats.

The Hog-fish attains the weight of twenty pounds, and is among the choicest of table-fish; its hard, white, exquisitely-flavored flesh has never been found injurious here, though in some parts of the West Indies it is regarded with suspicion. The common name refers to the swine-like profile and dentition.

HARPE RUFUS, (*Linné*) *Gill.*

SPANISH LADY-FISH.

Pudiano vermellio, MARCGRAVE, Hist. &c., Brasil, iv, 1648, 145.

Turdus flavus (Hog-fish), CATESBY, Nat. Hist. Carol. Florida and the Bahama Islands, ii, 1743, 11, tab. xi, f. 1.

Labrus rufus, LINNÉ, Syst. Nat. ed. 10, 1, 1758, 284; ed. 12, 1, 1766, 475.—GMELIN, Linné, Syst. Nat. 1, 1788, 1287.—SCHNEIDER, Bloch, Syst. Ichth. 1801, 244.—LACÉPÈDE, Hist. Nat. Poiss. iii, 1803, 427.

Cossyphus rufus, GÜNTHER, Cat. Fish. Brit. Mus. iv, 1862, 108.—COPE, Trans. Am. Phil. Soc. Phila. 1870, 463.

Harpe rufus, GILL, Proc. Acad. Nat. Sci. Phil. 1863, p. 222.

Bodianus rufus, POEY, Rep. Fis.-Nat. Cuba, ii, 1868, 331.

Perro colorado, PARRA, Descr. Dif. Piez. Hist. Nat. Cuba, 1787, 3, lam. iii, fig. 1.

Bodianus bodianus, BLOCH, Ichth. vii, 1797, 24, tab. ccxxiii.

Cossyphus bodianus, CUV. & VAL., Hist. Nat. Poiss. xiii, 1839, 103.

Lutjanus verres, BLOCH, op. cit. tab. cclv.

Sparus verres, SHAW, Gen. Zool. iv, 1803, 414.

Cossyphus verres, CASTELNAU, Anim. Nouv. ou Rares, Amérique du Sud, Ichth. 1855, 27.

Sparus falcatus, BLOCH, op. cit. tab. cclviii.

Bodianus Blochii, LACÉPÈDE, Hist. Nat. Poiss. iv, 1803, 279, 290.

Harpe cœruleo-aureus, LACÉPÈDE, op. cit. 426, 427, tab. viii. fig. 2.

Labrus semiruber, LACÉPÈDE, op. cit. iii, 428.

Not common. The species is also recorded from various of the West India Islands, the Gulf of Mexico, Bahia, Rio de Janeiro, and Saint Helena. Closely-related species are known in the Spanish and French Antilles under the names "Doncella" and "Demoiselle," and the Bermudian name may perhaps be interpreted to mean "the fish which the Spanish call Lady-fish." The name is not inappropriate, for the species is remarkable for the grace of its form and the beauty and elegance of its colors. My specimens measure eight inches.

Color.—Head and upper half of body to the third ray of the soft dorsal rich chestnut-brown; the remainder, including the lower half of the operculum, bright golden-yellow.

The lips have conspicuous folds. The pre-operculum is *very perceptibly denticulated.* The two anterior ventral rays and the soft dorsal and anal and the caudal lobes are much produced, the dorsal and anal prolongations extending to the middle of the median caudal rays; the outer caudal rays are twice as long as the median.

POMACENTRIDÆ.

GLYPHIDODON SAXATILIS, (*Linné*) *Cuvier.*

Cow-pilot; Sergeant-major.

Jaguacaquare, Marcgrave, Hist. &c. Brasil. iv, 1648, 156.

Sparus fasciis quinque transversis fuscis, Linné, Amœn. Acad. i, 1749, 312.

Chætodon fasciis quinque albis, cauda bifurca, Linné, Mus. Ad. Fried. i, 1754, 54.

Chætodon saxatilis, Linné. Syst. Nat. ed. 10. 1, 1758, 277; ed. 12, 1, 1766, 466.—Gmelin, Linné, Syst. Nat. 1, 1788, 1253.—Bloch, Ichth. vi, 1787, 71, tab. ccvi, f. 2.

Glyphisodon saxatilis, Cuv. & Val., Hist. Nat. Poiss. v, 1830, 446.—Müller & Troschel Schomburgk's Hist. Barbados, 1848, 674.—Castelnau, Anim. Nouv. ou Rares, Amérique du Sud, 1855, 11.

Glyphidodon saxatilis, Günther, Cat. Fish. Brit. Mus. iv, 1862, 36.—Poey, Rep. Fis.-Nat. Cuba, ii, 1868, 329.—Cope, Trans. Am. Phil. Soc. 1870, 461.

Chætodon Marginatus, Bloch, op. cit. tab. ccvii.—Lacépède, Hist. Nat. Poiss. iv, 1803, 451, 463.

Chætodon Mauritii, Bloch, op. cit. tab. ccxiii, f. 1.—Schneider, Bloch, Syst. Ichth. 1801, 234.—Lacépède, op. cit. 452, 470.

Chætodon sargoides, Lacépède, op. cit. 453, 471, 472.

Very common in sheltered waters. The largest, six to eight inches in length, frequent the shallow shaded coves in company with *Pseudoscarus vetula*, *Holacanthus ciliaris*, and *Sarothrodus bimaculatus.* The young may be seen basking in every shallow tide-pool. The origin of the common name is not apparent, unless it refers to some supposed relation between this species and the Cow-fish (*Acanthostracium quadricorne*), such as *Naucrates ductor* is supposed by sailors to hold with the Sharks. The fish is sometimes called the "Sergeant-major," in allusion to the chevron-like bands of yellow on the sides. The species is very common throughout the West Indies, and has been observed as far south as Bahia and east to the Cape Verde Islands. Its accidental occurrence at Newport, R. I., has been recorded.

Color.—Adults golden-green, young golden-yellow, with five black cross-bands, which are not as broad as the interspaces between them, the first from a point in front of the origin of the dorsal to the base of the pectoral; the second below the third and fifth dorsal spines; the third from the eighth and tenth dorsal spines toward the vent; the fourth from the twelfth and thirteenth dorsal spines to the middle of the anal; the fifth below the end of the soft dorsal and continued on the posterior rays of the dorsal and anal.

The ventrals, soft dorsal, and anal are produced; the fourth and fifth rays of soft dorsal and the fifth and sixth of anal longest. Dorsal and anal prolongations in young reaching to a point half-way between the posterior angle of dorsal and the base of caudal rays; in adults reaching quite beyond the base of caudal rays. External caudal rays twice the length of median.

GERRIDÆ.

EUCINOSTOMUS GULA, (*Cuv. & Val.*) *Goode.*

SHAD.

Gerres gula, CUV. & VAL., Hist. Nat. Poiss. vi, 1830, 464.—JENYNS, Zool. Voy. H. M. S. Beagle, 1842, 58.—GÜNTHER, Cat. Fish. Brit. Mus. iv, 1862, 255.—MÜLLER & TROSCHEL, Schomburgk, Hist. Barbados, 1848.—POEY, Mem. Hist. Nat. Cuba, ii, 1861, 368.

Diapterus gula, POEY, Rep. Fis.-Nat. Cuba, ii, 1868, 323.

Common and secured in quantity in the shallow bays, with *Decapterus punctatus*, *Eucinostomus Lefroyi*, and *Trachurops crumenophthalmus*. The largest specimens seen, which were apparently adult, measure six inches in length; intermediate sizes down to one inch were observed.

The species has also been seen about Martinique, Santo Domingo, Cuba, Jamaica, and Bahia. The "*Turdus cinereus peltatus*" of Catesby,* for which he gives the common name of "Shad," seems to be identical with this species or the closely-allied *Eucinostomus aprion*, if not with the following species.

EUCINOSTOMUS LEFROYI, *Goode.*

LONG-BONED SHAD.

Diapterus Lefroyi, GOODE, Amer. Journ. Sci. & Arts, viii, 1874, (Aug.) 123.

This species is distinguished from all other members of the family and genus by its relatively greatly-elongated form. The body is fusiform, compressed; its greatest height, at the thoracic region, being a little less than one-fourth (0.23) of the total length, and a little more than one-fourth (0.27) of the length without caudal (0.89). In *Eucinostomus aprion*, the most elongated of the species hitherto described, the greatest height is but one-third of the length.

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* Natural History of Carolina, Florida, and the Bahamas, ii, p. 11, tab. xi, fig. 1.

The height of the body is uniform under the spinous portion of the dorsal, sloping gently, and at a nearly uniform angle above and below, to the middle of the caudal peduncle. The height of the body behind the dorsal (0.10) is less than one-half, that of the least height of the tail (0.06) is one-fourth of the greatest height of the body.

The scales are large, measuring 0.03 and 0.04 in height, and 0.02 and 0.03 in length; they form about forty-five oblique transverse rows between the head and the caudal, four and a half longitudinal rows between the back and the lateral line, and ten longitudinal between rows the lateral line and the belly.

The length of the head (0.22) equals the greatest height of the body, and is double the greatest width of the head (0.11); the height at the pupil (0.14) is double the width of the interorbital space (0.07). The length of the snout (0.06) equals the length of the operculum (0.06); when the mouth is protruded, the length of the snout is doubled (0.12), and when retracted, the posterior extremity of the intermaxillary process extends to the vertical through the center of the pupil. The nasals are very prominent, and the nostrils are nearer to the orbit than to the extremity of the jaw. The orbit is circular, its diameter (0.08) one-third the length of the head.

The origin of the dorsal is slightly behind that of the ventral; its distance from the snout (0.31) twice the length of its base (0.16). The dorsal spines are graduated nearly in the proportion (I = 0.02; II = 0.12; III = 0.11; IV = 0.10; V = 0.09; VI = 0.085; VII = 0.725; VIII = 0.05; IX = 0.04). The notch between the spinous andsoft portions is very deep, and the connecting membrane barely perceptible. In the soft dorsal, the fifth ray is the longest (0.09), and equals the fifth spine; the succeeding rays diminishing regularly to the last, which equals the ultimate spine (0.04); the length of its base (0.20) is greater than that of the spinous dorsals. The anal begins behind the center of the body (0.56); the first spine is very short (0.01), one-fifth the length (0.05) of the second, which is slender; the first ray is the longest (0.08); the succeeding rays regularly diminishing in length to the last (0.03). The lobes of the caudal are equal; the outer rays in length (0.21) five times the inner ones (0.04). The extremity of the pectoral reaches the vertical from the last dorsal spine; its distance from the snout at the axilla (0.25) is nearly equal to the length of the body. The ventral spine resembles the fifth dorsal spine in shape and size. The length of the longest ray (0.11) slightly exceeds one-third of the distance from the snout to the ventral axilla (0.30); the axillary appendage consists of four lanceolate scales, the first and the longest as long as the last ventral ray.

Color.—Silvery, with a bluish tint above; axils of the pectorals and extremity of snout brownish. Radial formula: D. IX, 10; A. II, 8, P. 12; V. I, 5; C. 3, 9, 9, 3.

The unit of measurement used above is the one-hundredth of the total length, which in an average specimen is 7.29 inches ($0^{m}.185$). The species is common in the protected inlets about the islands, in company with the preceding species, the "Shad." The "Long-boned Shad" are in much demand for bait, and are easily seined in large quantities.

The species is dedicated to his excellency Maj. Gen. J. H. Lefroy, F. R. S., governor of the Bermudas, a gentleman of well-known scientific attainments and reputation, who, while doing so much for the social and political welfare of the islands, is also taking an active part in the development of their natural history.

Since the publication of the preliminary description of this fish, I have had the opportunity of comparing specimens from the Bermudas with others sent from Havana to the National Museum by Professor Poey, by whom the species had been recognized as new, and described in MS. under the name of *Eucinostomus productus.* The specimens are precisely the same, and coincide in having only two anal spines; a character in which they differ from the remainder of the genus, and which may prove to be, as suggested by Professor Poey, an indication of generic distinction.

TEUTHIDIDÆ.

ACANTHURUS NIGRICANS, (*Linné*) *Gill.*

DOCTOR-FISH.

Turdus rhomboidalis, CATESBY, Nat. Hist. Carolina, Flor. and the Bahama Islands, ii, 1743, 10, tab. x, fig. 1.

Chætodon nigriscens cauda albescente æqali utrinque aculeata, ARTEDI, Desc. Spec. Pisc. 90.

Chætodon nigricans, LINNÉ, Syst. Nat. ed. 10, 1, 1758, 274; ed. 12, 1, 1766, 462.—GMELIN, Linné, Syst. Nat. 1, 1788, 1245.

Acanthurus nigricans, GILL in Baird's Report Sea Fisheries of Southern New England, 1873, 801.

Acanthurus cœruleus, SCHNEIDER, Bloch, Syst. Ichth. 1801, 214.—CUV. & VAL., Hist. Nat. Poiss. x, 1835, 179.—GUICHENOT, Poiss. in Sagra, Hist. Nat. Cuba, 1845, 121.—STORER, Syn. Fish. N. Amer. 1846, 112.—CASTELNAU, Anim. Nouv. ou Rares, Amérique du Sud, 1855, 25, pl. 12, f. 2.—GÜNTHER, Cat. Fish. Brit. Mus. iii, 1861, 336.—POEY, Rep. Fis.-Nat. Cuba, ii, 1868, 355.—COPE, Trans. Am. Phil. Soc. 1870, 474.

Not uncommon. The species extends through the West Indies, and has also been observed on the coasts of Florida and South Carolina. Its quick nervous movements, as it plays about the recesses in the reef, are very characteristic. The local name has reference to the lancet-like processes on the sides of the caudal peduncle. The "Barbero" and "Barbeiro" of Cuba and Brazil, and the "Chirurgien-bleu," "Porte Lancette," and "Saigneur" of the French Antilles, are names of similar origin.

Color.—Bluish-brown; dorsal and anal with numerous obliquely longitudinal lines of light blue. Caudal spine amber-colored, glassy, posteriorly half as long as anteriorly. A prominence in front of orbit; profile of snout slightly concave. Operculum, pre-operculum, and scapular bones with deep striæ. Upper jaw with seven, lower with eight five to eight lobed incisors.

ACANTHURUS CHIRURGUS, (*Bloch*) *Schneider.*

DOCTOR-FISH.

Chœtodon nigricans, BLOCH, Ichth. vi, 1787, 60, tab. cciii (not Linné).

Acanthurus nigricans, SCHNEIDER, Bloch, Syst. Ichth. 1801, 211.

Chœtodon chirurgus, BLOCH, op. cit. tab. ccviii.—GMELIN, Linné, Syst. Nat. 1788, 1259.

Acanthurus chirurgus, SCHNEIDER, op. cit. 214.—CUV. & VAL., Hist. Nat. Poiss. x, 1835, 168.—GUICHENOT, Poiss. in Sagra, Hist. Nat. Cuba, 1845, 120.—STORER, Syn. Fish N. Am. 1846, 112.—CASTELNAU, Anim. Nouv. ou Rares, Amérique du Sud, 1855, 24.—GÜNTHER, Cat. Fish. Brit. Mus. iii, 1861, 329.—POEY, Rep. Fis. Nat. Cuba, ii, 1868, 355.—COPE, Trans. Am. Phil. Soc. Phila. 1870, 474.—GILL in Baird's Rep. Fisheries of Southern New England, 1873, 801.

Acronurus fuscus, GRONOW, Cat. Fish. (1780), ed. Gray, 1854, 191.

This species undoubtedly occurs, associated as it always is with the preceding. The name "Tang," found in the list of local names, is probably applied to one or both, if we can judge from the remarkable correspondence of the local names in the Bermuda and Bahama groups.

CHÆTODONTIDÆ.

SAROTHRODUS BIMACULATUS, (*Bloch*) *Poey.*

FOUR-EYED FISH.

Chætodon bimaculatus, BLOCH, Ichth. vii, 1797, tab. ccxix, f. 1.—SCHNEIDER, Bloch, Syst. Ichth. 1801, 225.—CUV. & VAL., Hist. Nat. Poiss. vii, 1831, 67.—STORER, Syn. Fish. N. Am. 1846, 86.—GÜNTHER, Cat. Fish. Brit. Mus. ii, 1861, 9.—POEY, Mem. Hist. Nat. Cuba, ii, 1861, 371.

Sarothrodus bimaculatus, POEY, Rep. Fis. Nat. Cuba, ii, 1868, 353.—COPE, Trans. Am. Phil. Soc. 1870, 474.

The "Four-eyed Fish" is usually seen in sheltered coves, lazily swimming a few feet below the surface, under the shadow of some high rock. Its local name has reference to the eye-like spots near the tail, which the fishermen believe to be a true pair of eyes. The species is also recorded from the northern West Indies.

Color.—Pearly-gray; snout, posterior edge of operculum, base of pectoral, the anal, caudal, and dorsal bright yellow, blending into the gray of the body. A band, black, edged with yellow, extends from a point in front of and below the first dorsal spine across the eye to the margin of interoperculum; soft dorsal with a large round indistinct black spot at its base between the fifth and twelfth rays, and a small spot of deep black at its angle; soft dorsal with narrow marginal line of black; soft anal with narrow, submarginal band of light blue, anteriorly edged with black; caudal with terminal band of bluish-white, with bright-yellow center; base of ventrals blotched with yellow.

HOLACANTHUS CILIARIS, (*Linné*) *Lacépède.*

ANGEL-FISH.

Acarauna major pinnis cornutis, CATESBY, Nat. Hist. Carolina, Florida, and the Bahama Islands, ii, 31, tab. xxxi, 1743.

Chætodon griseus fasciis quatuor fuscis, LINNÉ, Mus. Ad. Fried. 1, 1754, 62, tab. xxxiii, f. 1.

Chætodon ciliaris, LINNÉ, Syst. Nat. ed. 10, 1, 1758, 276; ed. 12, 1, 1766, 465.—GMELIN, Linné, Syst. Nat. 1, 1788, 1252.—BLOCH, Ichth. vi, 1788, 83, taf. ccxiv.—SCHNEIDER, Bloch, Syst., Ichth. ed. 1801, 218.

Holacanthus ciliaris, LACÉPÈDE, Hist. Nat. Poiss. iv, 1803, 527-534.—CUV. & VAL. Hist. Nat. Poiss. vii, 1831, 154.—GÜNTHER, Cat. Fish. Brit. Mus. ii, 1861, 46.—POEY, Mem. Hist. Nat. Cuba, ii, 1861, 371; Rep. Fis.-Nat. Cuba, ii, 1868, 351.—GILL, Baird, Rep. on Sea Fisheries of Southern New England, 1873, 802.

Gabelita, PARRA, Desc. Dif. Piezas Hist. Nat. Cuba, ii, 1787, 11, tab. vii, f. 1.

Chætodon Parræ, SCHNEIDER, op. cit. 235 (on Parra's figure).

Chætodon squamulosus, Shaw, Nat. Misc. ——, 275.
Chætodon Catesbeii, Shaw, Gen. Zool. iv, 1, 1803, 325.
Chætodon cornutus, Desmarest, Déc. Ichthyol.
Chætodon aculeatus, Gronow, Cat. Fishes (1780), ed. Gray, 1854, 72.

Common. The species is found, also, in the West Indies, at Bahia, and on the coasts of Mexico. The Angel-fish is partial to sheltered parts of the reef, where it may be seen lazily and gracefully swimming or floating a few feet below the surface. Its motions are very slow, and it frequently swims upon its side, or, sinking to the bottom, swims perpendicularly to the surface, where its bright colors flash for a moment as it floats broadside upward. I have frequently seen them grazing upon the alga-covered rocks. The Angel-fish attains the weight of four pounds, and as far surpasses all the other fishes of the region in its delicious flavor as in its lovely hues. The largest I have seen measured fifteen inches from snout to extremity of soft dorsal.

Color.—Brown with a shade of olive-green, each scale edged with a lighter tint; on the dorsal and anal fins, the brown has reddish tinge. Chin, nape, base of pectoral, borders, and spines of operculum and preoperculum, bright cobalt-blue. Extremity of pectorals, bright yellow. Borders of dorsal and anal bright blue, passing through a vivid green to bright yellow on the slender streamers formed by the prolongations of the soft dorsal and anal fins. Caudal bright yellow, with narrow border of greenish blue. Base of ventrals blue, passing through green into yellow at the extremities. Young and half-grown individuals are ornamented with three or four broad transverse bands of blue and yellow.

My specimens, some twelve in number, differ from all descriptions in the absence of the spot of brown, encircled with blue, on the nape. I have examined numerous West Indian specimens and find it universally present. Should this character prove constant, the Bermuda Angel-fish may be considered a geographical variety, *Holacanthus ciliaris*, var. *Bermudensis.*

HOLACANTHUS TRICOLOR, (*Bloch*) *Lacépède.*

Black Angel-fish.

Acarauna, Edwards, pl. 583, f. 4.
La Veuve Coquette, Duhamel, Trait. Gén. Pesch. 1782, pt. 2, pl. 13, f. 1.
Catalineta, Parra, Descr. Dif. Piez. Hist. Nat. Cuba, 1787, 12, lam. vii, f. 2.
Chætodon tricolor, Bloch, Ichth. xii, 1797, tab. 425.—Schneider, Bloch, Syst. Ichth. 1801, 219.

Holacanthus tricolor, LACÉPÈDE, Hist. Nat. Poiss. iv, 1803, 525-530.—CUV. & VAL., Hist. Nat. Poiss, vii, 1831, 162.—CASTELNAU, Anim. Nouv. ou Rares, Amér. du Sud, 1855, 19.—GÜNTHER, Cat. Fish. Brit. Mus. ii, 1861, 49.—POEY, Mem. Hist. Nat. Cuba, ii, 1861, 371; Rep. Fis.-Nat. Cuba, ii, 1868, 352.

Occasional. Mr. Jones captured a specimen in 1871, and the name occurs on the local list. The species occurs throughout the West Indies, and is also recorded from Bahia and Trinidad.

Chætodon arcuatus, (Linn.) Cuvier, is also likely to occur in these waters.

XIPHIIDÆ.

The name of "Sword-fish" occurs on the local list. The common Sword-fish (*Xiphias gladius*, Linn.) must occur in Bermuda waters, and probably also *Tetrapturus albidus*, Poey, and *Histiophorus americanus*, Cuv. & Val.

The following reference to the Sword-fish occurs in "Newes from the Bermudas," a pamphlet dated Burmuda, July, 1609, and reprinted in "Force's Historical Tracts," vol. ii.

Whale, Sword-fish & Threasher.—"The sword fish swimmes under the whale, & pricketh him upward: The Threasher keepeth above him, & with a mighty great thing like unto a flaile, hee so bangeth the whale, that hee will roare as though it thundered, & doth give him such blowes, with his weapon, that you would thinke it to be a crake of great shot."—(Page 22.)

SCOMBRIDÆ.

ORCYNUS ALLITERATUS, (*Rafinesque*) *Gill.*

MACKEREL.

Scomber alliteratus, RAFINESQUE, Caratteri &c. Anim. Sicilia, 1810, 46.

Orcynus alliteratus, GILL, Baird, Rep. Sea Fisheries of Southern New England, 1873, 802.—BAIRD, Rep. Sea Fisheries of Southern New England, 1873, 825.

Maquereau à Quatre Points, GEOFFR. ST. HILARIE, Desc. Egypt. Hist. Nat. 1813, pl. xxiv, f. 3.

Thynnus Leachianus, RISSO, Hist. Nat. Eur. Merid. iii, 1827, 414.

Thynnus thunnina, CUV. & VAL., Hist. Nat. Poiss. viii, 1831, 104.—BLEEKER, Verhandl. Batav. Genootsch. xxiv, 1851, 36.—TEMM. & SCHLEG., Fauna Japonica Poiss. 1850, 95, pl. 48.—GUICHENOT, Rept. et Poiss. Exp. Scient. Algérie, 1850, Poiss. 57.—GÜNTHER, Cat. Fish. Brit. Mus. ii, 1861, 364.

Orcynus thunnina, POEY, Rep. Fis.-Nat. Cuba, 1, 1867, 321; ii, 1868, 362.

Thynnus Brasiliensis, CUV. & VAL., op. cit. 110.—POEY, Mem. Hist. Nat Cuba, ii, 1861, 373.

Thynnus vagans, LESSON, Voy. Coquille, Zool. ii, 1830, 162, pl. cxxxii.

Large schools were observed in March. This large and powerful pelagic fish has been observed in the Mediterranean, on the east of Norway, in the East Indies, on the coasts of Brazil and Cuba, and was found in 1871 by Professor Baird in large numbers at Wood's Hole, Mass., and several have since been taken on the shores of Southern New England. It is highly valued for bait, but is the only large fish which is not thought good to eat; though rather oily, I think it superior to many of the Bermuda food-fishes. It attains the length of two feet and a half.

CARANGIDÆ.

DECAPTERUS PUNCTATUS, (*Agassiz*) *Gill.*

ROUND ROBIN.

Scomber hippos, MITCHILL, Amer. Month. Mag. 1818, 246 (not Linné), (figured as "The Hippos Mackerel," Trans. Lit. & Phil. Soc. N. Y. 1815, pl. 5, f. 5).

Caranx punctatus, AGASSIZ, Selecta Gen. et Spec. Pisc. Brasil, coll. Spix, 1829, 108, pl. lvi *a*, f. 2.—CUV. & VAL., Hist. Nat. Poiss. ix, 1833–38.—DEKAY, New York Fauna, Fish, 1842, 122, pl. 73, f. 123 (copied from Mitchill).—STORER, Syn. Fish. N. Am. 1846, 101.—GÜNTHER, Cat. Fish. Brit. Mus. ii, 1861, 446.

Decapterus punctatus, GILL, Proc. Acad. Nat. Sci. Phila. 1862, 432; and in Baird, Rep. on Sea Fisheries of Southern New England, 1873, 803.—POEY, Rep. Fis.-Nat. Cuba, ii, 1868, 368 (see, also, Mem. ii, 374).—BAIRD, Rep. on Sea Fisheries of Southern New England, 1873, 825.

Very common. This species ranges along the coast from Brazil to Cape Cod, and has been seen at Cuba and Martinique. The Round Robin is seined in great numbers in Hamilton Harbor, in company with the various species of *Clupeidæ* and *Gerridæ*, and is sold from row-boats along the quay at the legal rate of four-pence a pound. The largest measure six inches. "Jigging robins" is a favorite amusement of the little negroes. A few bread-crumbs are thrown over the dock, and the little fish collect in such numbers that a line with a bare fish-hook jerked rapidly through the group seldom fails to impale one or more. The local name seems to be fanciful in origin; at Barbados, it is given to the allied species *Decapterus macarellus*, which perhaps also occurs at the Bermudas.

Color.—Above, olive-brown; beneath, white, with pearly reflections. A golden stripe along the lateral line, studded with small black spots, which cease at the commencement of the lateral plates. Eye yellow, with black iris.

TRACHUROPS CRUMENOPHTHALMUS, (*Bloch*) *Gill.*

GOGGLER; GOGGLE-EYE.

Scomber crumenophthalmus, BLOCH, Ichth. x, 1797, 65, taf. cccxliii.

Caranx crumenophthalmus, LACÉPÈDE, Hist. Nat. Poiss. iv, 1803, 107.—CUV. & VAL., Hist. Nat. Poiss. ix, 1833, 62.—GÜNTHER, Cat. Fish. Brit. Mus. ii, 1861, 429.

Trachurops crumenophthalmus, GILL, Proc. Ac. Nat. Sci. Phila. 1862, 432; and in Baird, Reps. on Sea Fisheries of Southern New England, 1873, 803.—POEY, Rep. Fis. Nat. Cuba, ii, 1868, 367.—BAIRD, Rep. on Sea Fisheries of Southern New England, 1873, 825.

Scomber balantiophthalmus, SCHNEIDER, Bloch, Syst. Ichth. 1801, 29.

Scomber plumieri, BLOCH, op. cit. tab. ccclxiv.—SCHNEIDER. op. cit. 30.

Caranx plumieri, CUV. & VAL., op. cit. 65.—MÜLL. & TROSCH., Schomburgk, Hist. Barbados, 1848, 669.—GUICHENOT, Poiss. in Sagra, Hist. Nat. Cuba, ii, 1845, 110.

Caranx Daubentonii, LAÇÉPÈDE, op. cit. iii, 59, 71.

Caranx macrophthalmus, RÜPPELL, Atlas, Reise Nord-Africa, Fische, 1828, 97, tab. xxv, f. 4 (not Agassiz).

Caranx macrophthalmus, AGASSIZ, in Spix, Select. Gen. & Spec. Pisc. Brasil, 1829, 107, pl. lvi *a*, f. 2 (not Rüppell).

Caranx mauritianus, QUOY & GAIMARD, Voy. Uranie & Physicienne, Zool. 1824, 359.

Common; the species, like the preceding, is found in the West Indies and on the coast of the United States to Southern Massachusetts; it is found also at Mauritius, in the Pacific and Indian Oceans, the Red Sea, and on the coast of Guinea. The Goggler reaches the weight of a pound, is found with the preceding, and is used for food. The local names refer to its great, staring eyes.

Color.—Above, bluish; beneath, silvery white.

PARATRACTUS PISQUETUS, (*Cuv. & Val.*) *Gill.*

JACK; BUFFALO JACK.

Caranx pisquetus, CUV. & VAL., Hist. Nat. Poiss. ix, 1833, 97.—POEY, Mem. Hist. Nat. Cuba, ii, 1861, 373.

Paratractus pisquetus, GILL, Proc. Ac. Nat. Sci. Phila. 1862, 432; Baird's Rep. Sea Fisheries of Southern New England 1873, 803.—POEY, Rep. Fis. Nat. Cuba, ii, 1868, 365.—BAIRD, Rep. Sea Fisheries of Southern New England, 1873, 825.

Caranx chrysos, DEKAY, Fishes, New York Fauna, 1842, 121, pl. xxvii, f. 85 (not *Scomber chrysos*, Mitchill).—BAIRD, Fishes New Jersey Coast, 1855, 22.

Carangus chrysos, GIRARD, Ichth. U. S. & Mex. Bound. Surv. 1859, 23.

Caranx hippos, HOLBROOK, Ichth. South Carolina, 1856, 88, pl. xii, fig. 2 (not *Scomber hippos*, Linné).

Carangus hippos, Gill, Cat. Fish. E. Coast N. Am. 1861, 36.

Trachurus squamosus, GRONOW, Cat. Fish. (1780), ed. Gray, 1854, 125.

The Jack, or Buffalo Jack, is common, occurring also in the West

Indies and on the coast of Brazil, and the United States as far north as Cape Cod. Its habits closely resemble those of the preceding species. My largest specimen is nine inches long; the fishermen claim that the species attains the weight of five or six pounds, but they probably confound this with some other species of the same family.

Color.—Above, light slate; beneath, pearly white; snout and line over the orbit blue. Second dorsal margined with black. Base of lateral plates and tip of caudal light brown.

NAUCRATES DUCTOR, (*Linné*).

PILOT-FISH.

Gasterosteus ductor, LINNÉ, Syst. Nat. ed. 10, 1, p. 295.

Naucrates ductor, CUV. & VAL., Hist. Nat. Poiss. viii, p. 312, pl. 332.

This universally-distributed species occasionally finds its way into the hands of the Bermudian fishermen.

ZONICHTHYS FASCIATUS, (*Bloch.*) Swainson.

BONITO.

Scomber fasciatus, BLOCH, Ichth. x, 61, taf. cccxli, 17; Syst. Ichth. ed. SCHNEIDER, 29.

Seriola fasciata, CUV. & VAL., Hist. Nat. Poiss. ix, 211, 1833.—GÜNTHER, Cat. Fish. Brit. Mus. ii, 464.

Zonichthys fasciatus, SWAINSON, Nat. Hist. Fish. & Rept.—GILL, Cat. Fish. E. Coast N. Am. 1861, v, 36, and in Rep. U. S. Com. Fish. 1871, 803.

Halatractus fasciatus, POEY, Rep. Fis. Nat. Cuba, ii, 373, 1868.

Not uncommon; recorded also from Cuba and South Carolina. A specimen was taken near New York in October, 1875, and is now in the National Museum. The Bonito is an excellent table-fish, and reaches the length of two feet or more.

The "Amber-fish," the "Guelly," or "Cavally" (Caballa ?), the "Slippery Dick," and the "Skip-jack" of the fishermen probably belong to this family; but, as I secured no specimens, they cannot be identified. The "Skip-jack" is perhaps an *Oligoplites*, and the "Amber fish" is doubtless a *Seriola*.

CORYPHÆNIDÆ.

CORYPHÆNA HIPPURUS, *Linn.*

DOLPHIN.

Coryphæna hippurus, LINNÉ, Syst. Nat. ed. 12, i, 446.

I observed a Dolphin, measuring five or six feet, playing about our steamer in the Gulf Stream, about two hundred miles northwest of the Bermudas. The Dolphin is well known to the fishermen.

MULLIDÆ.

HYPENEUS MACULATUS, (*Bloch*) *Cuv.*

GOAT-FISH.

Pira metara, MARCGRAVE, Hist. &c. Brasil, 1648, 156, 181.

Mullus maculatus, BLOCH, Ichth. x, 1797, 79, tab. 348.—SCHNEIDER, Bloch, Syst. Ichth. 1801, 78.

Upeneus maculatus, CUV. & VAL., Hist. Nat. Poiss. iii, 1829, 478.—STORER, Syn. Fish. N. Am. 1846, 48.—POEY, Mem. Hist. Nat. Cuba, i, 1853, 223; ii, 1861, 367.—CASTELNAU, Anim. Nouv. &c. Amérique du Sud, Pois. 1855, 6.—GÜNTHER, Cat. Fish. Brit. Mus. i, 1861, 408.—COPE, Trans. Am. Phil. Soc. 1870, 471.

Mullhypeneus maculatus, POEY, Rep. Fis.-Nat. Cuba, ii, 1868, 307.

I did not secure a specimen, but was told that a fish of this description is common among the reefs. Godet, in his "History of Bermuda," gives a description of color which is apparently taken from specimens by him, which renders the identification sufficiently certain. The species is also recorded from Cuba, Jamaica, Martinique, and Rio de Janeiro.

BERYCIDÆ.

HOLOCENTRUM SOGO, *Bloch.*

SQUIRREL.

Jaquaraca, MARCGRAVE, Hist. &c. Brasil, 1648, 147.

Perca marina rubra, CATESBY, Nat. Hist. Carolina, Florida, and the Bahama Islands, ii, 1743, 2., tab. ii, f. 2.

Bodianus pentacanthus, BLOCH, Ichth. vii, 1797, 29, tab. ccxxxv (a badly-distorted copy of Marcgrave's figure).

Holocentrus sogo, BLOCH, op. cit. 46, tab. ccxxxii.

Holocentrum sogho, GILL, Cat. Fish. E. Coast N. Am. 41, 186; and in Baird's Rep. on Sea Fisheries of South. New England, 1873, 804.

Holocentrus rubellus laminis branchiostegis serratis etc., BROWN, Hist. &c. Jamaica, 1799, 447.

Sogo holocentrus, SHAW, Gen. Zool. v. 1803, 555.

Bodianus jaguar, LACÉPÈDE, Hist. Nat. Poiss. &c. iv, 1803, 286.

Sciœna rubra, SCHNEIDER, Bloch, Syst. Ichth. 1801, 82 (not Forskâl).

Holocentrum longipinne, CUV. & VAL., Hist. Nat. Poiss. iii, 1829, 181.—STORER, Syn. Fish. N. Am. 1846, 46.—GÜNTHER, Cat. Fish. Brit. Mus. i, 1861, 28.—COPE, Trans. Am. Phil. Soc. 1870, 465.

Common; its bright color and nervous darting motions rendering it one of the most conspicuous denizens of the rock-pools. It is found throughout the West Indies and south to Brazil. Their voracity is very great, and the tyro in angling usually finds his first prize to be a "Squirrel." They are not often eaten. They breed plentifully about the islands, and reach a length of fifteen inches; the lobes of the vertical fins becoming proportionally more and more produced with age. The local name is the same as that given by Catesby, and refers to a grunting noise uttered by them, which resembles the bark of a squirrel.

The Cuban form seems to be nearly the same; but Professor Poey hesitatingly places it in a distinct species.

SCIÆNIDÆ.

GENUS PAREQUES, *Gill*, MS.*

PAREQUES ACUMINATUS, (*Schneider*) Gill.

CARRUB.

Grammistes acuminatus, SCHNEIDER, Bloch. Syst. Ichth. 1801, 184.

Eques acuminatus, CASTLENAU, Anim. Nouv. &c. Amérique du Sud, Poiss. 1855, 11.—GÜNTHER, Cat. Fish. Brit. Mus. ii, 1861, 280.—POEY, Mem. Hist. Nat. Cuba, ii, 1861, 370; Rep. Fis.-Nat. Cuba, ii, 1868, 325.—COPE, Trans. Am. Phil. Soc. 1870, 471.

Eques lineatus, CUV. & VAL., Hist. Nat. Poiss. v, 1830, 169.

Common here, though of rare occurrence elsewhere, having been observed only at Cuba, Santa Cruz, and Bahia; not valued for food. My specimens measure eleven inches. The name "Carrub" is inexplicable, unless it be a corruption of "Carp."

Color.—Tawny-yellow; extremities of fins and base of pectorals and ventrals blackish-brown; head blotched with the same. Two specimens have seven straight, longitudinal lines upon the side; the third is without any traces of such markings. Whether this difference is sexual, I have no means of determining. The first dorsal is one-fourth the height of the body, measured immediately below it.

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* The genus *Pareques* is distinguished, according to Professor Gill, by the development of the spines of the first dorsal fin in normal number, (ten or eleven,) as well as other osteological characters.

SPARIDÆ.

CALAMUS MEGACEPHALUS, *(Swainson) Poey.*

GOAT'S HEAD PORGY.

Pagellus calamus, CUV. & VAL., Hist. Nat. Poiss. vi, 1830, 206, pl. 152.—POEY, Mem. Hist. Nat. Cuba, ii, 1861, 367.

Sparus calamus, POEY, Rep. Fis.-Nat. Cuba, ii, 1868, 308.

Calamus megacephalus, SWAINSON, Nat. Hist. Fish, ii, 1839, p. 222.—GUICHENOT, Mem. Soc. Imp. Sci. Nat. Cherbourg, xix, 1868, 112.—POEY, Ann. Lyc. Nat. Hist. x, 1874, 178.

Common; found also in the West Indies, reaching south to Bahia. My specimens measure from six to eighteen inches.

CALAMUS ORBITARIUS, *Poey.*

SHEEP'S-HEAD PORGY.

Pagellus orbitarius, POEY, Mem. Cuba, ii, 1860, 201; 1861, 367.

Sparus orbitarius, POEY, Rep. Fis.-Nat. Cuba, ii, 1868, 308.

Calamus orbitarius, POEY, Ann. Lyc. Nat. Hist., N. Y., x, 1874, 79.

Common; recorded also from Cuba. This species very closely resembles the preceding in form and habits, but is easily distinguished by the shortness of the snout, which gives it a very abrupt profile. In *S. calamus*, the diameter of the orbit is contained twice in the distance from the extremity of the snout to the perpendicular from the anterior border of the orbit; in *S. orbitarius*, once and one-half. The height of the two specimens before me is the same; and, in *S. calamus*, the height is contained in the length twice and three-quarters; in *S. orbitarius*, twice and one-half. The specimens measure sixteen and fifteen inches, respectively.

Color.—Both species, greenish-olive, with golden longitudinal stripes. The names Goat's-head and Sheep's-head no doubt refer to the enormous pre-orbital bones which impart an ovine physiognomy to the fish. The Porgies are taken with the hook in large quantity, and rank among the most salable kinds. They live in deep water; and, when brought to the surface, their bellies are greatly expanded from the removal of pressure, giving them a very comical appearance.

SARGUS VARIEGATUS, (*Lacépède*,) *Goode*.

CHUB.

Sparus Sargus, LINNÉ, Syst. Nat. ed. 10, 1, 1758, 278; ed. 12, 1, 1766, 469.—GMELIN, Linné, Syst. Nat. 1, 1788, 1270.—BLOCH, Ichth. viii, 1797, 31, tab. cclxiv.—SCHNEIDER, Bloch, Syst. Ichth. 1801, 270.—LACÉPÈDE, Hist. Nat. Poiss. iv, 1803, 27, 77.—RISSO, Ichth. Nice, 1810, 236.

Sargus variegatus, LACÉPÈDE, op. cit. iv, 1803, 207 (from HAÜY, Encyclopédie Méthodique.)

Sargus raucus, GEOFFROY ST. HILAIRE, Descr. de l'Égypte, Poiss. 1813, pl. xviii, f. 1.

Sargus Rondeletii, CUV. & VAL., Hist. Nat. Poiss. vi, 1830, 14, pl. cxli.—VALENCIENNES. Webb & Berthelot, Hist. Nat. Canaries, Poiss. 1836, 28.—GUICHENOT, Expl. Scient. Algérie, Poiss. 1850, 46.—GÜNTHER, Cat. Fish. Brit. Mus. 1861, 44.

Very abundant; occurring in large schools in company with *Pimelepterus Boscii*, which it closely resembles in form and habits. It is strictly European, and is especially common in the Mediterranean, but has not been found west of Madeira and the Canaries. I have carefully compared Bermudian specimens with Mediterranean specimens in the Bonaparte collection labeled *Sargus Rondeletii*. The Chub is seined in vast quantities in Hamilton Harbor and other secluded bays. My specimens measure from ten to twelve inches.

PIMELEPTERIDÆ.

PIMELEPTERUS BOSCII, *Lacépède*.

BREAM.

Chætodon cyprinaceus. BROUSSONET, MS.—GMELIN, Linné, Syst. Nat. 1, 1788, 1269, note

Pimelepterus Boscii, LACÉPÈDE, Hist. Nat. Poiss. iv, 1803, 429.—CUV. & VAL., Hist. Nat. Poiss. vii, 1831, 258.—VALENCIENNES, in Webb & Berthelot, Hist. Nat. Canaries, 1836, pl. xix.—DEKAY, Zool. N. Y. Fishes, 1842, 100, pl. xx, fig. 56.—STORER, Syn. Fish. N. A. 1846, 89.—GÜNTHER. Cat. Fish. Brit. Mus. i, 1861, 497.—GILL, Cat. Fish. E. Coast N. Am. 1861, 31.—POEY, Rep. Fis.-Nat. Cuba, ii, 1868, 323.—GILL, in Baird's Rep. on Sea Fisheries of S. New England, 1873, 805.—BAIRD, Rep. Sea Fisheries of S. New England, 1873, 824.

Pimelepterus incisor, VALENCIENNES, op. cit. 805.

Common. The Bream is always found in company with the preceding species, to which it is very like in size, shape, and habits, and is taken with it in large numbers and brought to the market. It is easily distinguished from the Chub, as far as it can be seen under water, by the large black spot just behind the dorsal. It is also recorded from Madeira, the Canaries, Jamaica, and Cuba. A single specimen was taken in the spring of 1873, at Staten Island, New York Harbor, by Mr. C. L. Copley, and sent by him to the Smithsonian Institution.

Color.—Golden-brown, with a longitudinal stripe of gold along the center of each row of scales, a silvery streak along the preorbital.

PRISTIPOMATIDÆ.

HÆMYLUM CAPEUNA, (*Lichtenstein*) *Goode.*

WHITE GRUNT.

Capeuna Brasiliensibus, MARCGRAVE, Hist. &c. Brasil, i, 1648, 155, f. 163.

Grammistes trivittata, SCHNEIDER, Bloch, Syst. Ichth. 1801, 188 (on Marcgrave's figure)

Serranus capeuna, LICHTENSTEIN, Abhandl. Berl. Akad. 1820–1, 288 (on Marcgrave's figure).

Hœmulon quadrilineatum, CUV. & VAL., Hist. Nat. Poiss. v, 1830, 288, pl. cxx.—STORER, Syn. Fish. N. Am. 1846, 75.—GÜNTHER, Cat. Fish. Brit. Mus. i, 1861, 316.—POEY, Rep. Fis.-Nat. Cuba, ii, 1868, 319.—GILL, in Baird's Rep. Sea Fisheries of S. New England, 1873, 806.

Hœmulum quadrilineatum, COPE, Trans. Am. Phil. Soc. 1870, 471.

Hœmulon quinquelineatum, POEY, Mem. Hist. Nat. Cuba, ii, 1861, 419; Rep. Fis.-Nat. Cuba, i, 1867, 310; ii, 1868, 162.

Common, occurring in schools. My specimens measure four inches. Cuvier's description of the color is excellent; but Günther, in quoting it, fails to mention, either in generic or specific diagnoses, the brilliant red of the lips and mouth, which Cuvier thought of sufficient importance to found upon it his generic name *Hœmulon*. I have made use of the specific name *capeuna*, because it seems to have priority over that usually accepted. The name *trivittata* can scarcely stand, since it is not only inapplicable, but sure to mislead, as is evident from the two other names which have been given to the species, viz, *quadrilineatum* and *quinquelineatum*.

The species is recorded from Brazil, San Domingo, and Cuba.

HÆMYLUM CHRYSOPTERUM, (*Linné*) *Cuvier.*

MARGATE-FISH.

Perca marina gibbosa cinerea (Margate-fish), CATESBY, Hist. Carolina, Florida, and Bahamas, ii, 1743, 2, pl. ii, f. 1.

Perca chrysoptera, LINNÉ, Syst. Nat. ed. 12, 1766, 485.—GMELIN, Linné, Syst. Nat. 1, 1788, 1314.

Lutjanus chrysopterus, LACÉPÈDE, Hist. Nat. Poiss. iv, 1803, 186, 226.

Hæmulon chrysopteron, CUV. & VAL., Hist. Nat. Poiss. v, 1830, 240—DEKAY, New York Fauna, Fishes, 1842, 85, pl. vii, f. 22.—STORER, Syn. Fish. N. Am. 1846, 75.—HOLLROOK, Ichth. South Carolina, 1855, 120, pl. xvii, f. 1.—GÜNTHER, Cat. Fish. Brit. Mus. i, 1861, 313.—GILL, in Baird's Rep. Sea Fisheries of S. New England, 1873, 806.

The Margate-fish of the fishermen is probably this species. It is common in summer, but was not to be found in the markets at the time of my visit. The species is recorded from the West Indies and Brazil. The fishermen recognize several others, as the Yellow, Streaked, Spotted, and Black Grunts, all of which probably belong to this family, if not to this genus.

LUTJANUS CAXIS, (*Schneider*) *Pocy.*

GRAY SNAPPER.

Caxis, PARRA, Descr. Dif. Pie. Hist. Nat. Cuba, 1787, 14, lam. viii, f. 2.

Sparus Caxis, SCHNEIDER, Bloch, Syst. Ichth. 1801, 284.

Lutjanus Caxis, POEY, Rep. Fis.-Nat. Cuba, i, 1867, 269; ii, 1868, 293.—GILL, in Baird's Report on Sea Fisheries of S. New England, 1873, 806.

Bodianus Vivanet, LACÉPÈDE, Hist. Nat. Poiss. iv, 1803, pl. iv, f. 3 (on a figure by Plumier).

Sparus tetracanthus, BLOCH, Ichth. viii, 1797, 279, 930 (on a figure of Plumier).

Cichla tetracantha, SCHNEIDER, op. cit. 338.

? *Bodianus striatus* (*Fasciatus*), SCHNEIDER, op. cit. 335, tab. lxv.

Lutjanus acutirostris, DESMAREST, Déc. Ichth. pl. ii, f. 1 (fide Cuvier).

Mesoprion griseus, CUV. & VAL., His. Nat. Poiss. ii, 1829, 471.—STORER, Syn. Fish. N. Am. 1846, 34.—GÜNTHER, Cat. Fish. Brit. Mus. i, 1861, 195.

Very common; distributed also throughout the Caribbean Sea and the Gulf of Mexico, and, according to Günther, who considers it identical with *Mesoprion gorcensis* Cuv. & Val., extending east to the African coast. It breeds abundantly, and hundreds of individuals from four feet to four inches in length may be seen in almost any sheltered nook. It is one of the most delicious of food-fish, its flavor not unlike that of the Blue-fish (*Pomatomus saltatrix*). Its extreme cunning renders it very difficult to capture with either hook, pot, or grains, and has gained it the *soubriquet* of "Sea Lawyer". The market-name is "Gray Snapper".

Color.—Dark gray, changing but slightly in spirits.

The synonomy of this and the allied forms is much ensnarled, and a careful study of a full series of specimens is desirable.

LUTJANUS AYA, (*Bloch*) *Gill.*

YELTING; GLASS-EYED SNAPPER.

Acara aya, MARCGRAVE, Hist. &c. Brasil, 1648, 167.

Bodianus aya, BLOCH Ichth. 1797, 33, tab. ccxxvii (on a figure by Prince Maurice).—LACÉPÈDE, Hist. Nat. Poiss. iv, 1803, 286.

Mesoprion aya, CUV. & Val., Hist. Nat. Poiss. ii, 1829, 457.—? GUICHENOT, Sagra's Hist. Nat. Cuba, Poiss. 1845, 24.—GÜNTHER, Cat. Fish. Brit. Mus. i, 1861, 198.

Lutjanus aya, GILL, MS.

Bodianus ruber, SCHNEIDER, Bloch, Syst. Nat. ed. 1801, 330.

Common. It probably breeds, as individuals of all ages occur; the largest weigh ten pounds or more, and are much esteemed as food. Its abrupt profile and large eyes give it a very sparoid appearance; to the latter feature it no doubt owes one of its popular names, a similar epithet being applied to the large-eyed *Stizostedium americanum*, the Wall-eyed or Glass-eyed Pike of the great lakes and the Mississippi Valley. The name "Yelting" is very puzzling.

Color.—Brilliant rose-red, fading in spirits to grayish-olive, with black blotch along the base of the soft dorsal; base of pectoral deep black.* The species is peculiarly West Indian. Large specimens are sometimes brought in winter to the Washington market, in lots from Florida.

The Schoolmaster Snapper and Silk Snapper of the fishermen probably belong to this genus. The Spot Snapper and the Yellow-tail correspond doubtless to *Mesoprion uninotatus* (Cuv. & Val.) Gill, and to *Ocyurus chrysurus* (Bl.) Gill. *Lutjanus cynodon* (Cuv.) Gill probably also occurs. All these species are peculiarly West Indian.

SERRANIDÆ.

TRISOTROPIS UNDULOSUS, (*Cuvier*) *Gill.*

ROCK-FISH.

Perca marina venenosa punctata (Rock-fish), CATESBY, Nat. Hist. Carolina, Florida, and Bahamas, ii, 1743, 15, tab. xv.—CUV. & VAL., Hist. Nat. Poiss. ii, 1829, 386.

Serranüs undulosus, CUV. & VAL., op. cit. 295.—GÜNTHER, Cat. Fish. Brit. Mus. i, 1861, 143.

Trisotropis undulosus, GILL, Proc. Acad. Nat. Sci. Phila. 1865, 105.

Serranus brunneus, POEY, Mem. Hist. Nat. Cuba ii, 1860, 1314.

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* Dr. Günther, in the "Synopsis of the Species", which serves as a key to the genus places this and the preceding species under the head "*aa. Ground-color olive, with a yellow, green, or brown shade.*" This is certainly very apt to mislead, and illustrates the difficulty of drawing correct ideas from the study of distorted and discolored museum-specimens.

Trisotropis brunneus, GILL, l. c.—POEY, Rep. Fis.-Nat. Cuba, ii, 1868, 156, 234; Annals Lyc. Nat. Hist. N. Y. ix, 1870, 305.

Serranus arara, POEY (not CUV. & VAL.), Mem. ii, 1860, 132.

Serranus decimalis, POEY, Mem. ii, 1860, 138.

Serranus cyclopomatus, POEY, Mem. ii, 1861, 353; Rep. ii, 1868, 284.

Serranus latepictus, POEY, Mem. ii, 1861, 353.

Very common; recorded also from the West Indies and the coast of Brazil. The Rock-fish attains the length of four or five feet, and is one of the choicest of table-fishes, though Catesby declares that his "Rock-fish", which seems most probably the same, "has the worst character for its poisonous quality of any other among the Bahama Islands".

Color.—Brown, thickly mottled with large, irregularly quadrilateral spots of brownish-violet. The sides of the head are marked with wavy, irregular lines of deep violet. Dorsal broadly margined with black; caudal, anal, and ventral tipped with deep black, which gradually shades into the color of the body; pectorals tipped with orange.

It may be regarded as somewhat doubtful whether the species of Cuvier is identical with that whose diagnosis is given by Dr. Günther under the same name, since the former makes no allusion to the yellow tips of the pectorals. Professor Poey, after an examination of one of Cuvier's types, pronounces it distinct from his *Serranus brunneus* by reason of a slightly-rounded caudal. The *Serranus undulosus* defined by Günther coincides with Poey's *Serranus brunneus* in its truncated caudal and in other respects. I have provisionally accepted Günther's identification of Cuvier's species. Catesby's figure disagrees in its slightly-forked caudal, but in other respects corresponds with the specimen before me; and, since no conjecture has been offered as to its relations, I have, after making allowances for the carelessness which the artist manifests in many of the other plates, ventured to refer it to the same species.

TRISOTROPIS GUTTATUS, (*Schneider*) *Gill.*

RED ROCK-FISH.

Bonacé cardenal, PARRA, Descr. Dif. Piez. His. Nat. Cuba, 1787, 29, lam. xvi, f. 1.

Johnius guttatus, SCHNEIDER, Bloch, Syst. Ichth. 1801, 77 (on Parra's figure).

Trisotropis guttatus, GILL, Proc. Acad. Nat. Sci. Phila. 1865, 105.

Serranus cardinalis, CUV. & VAL., His. Nat. Poiss. ii, 1829, 378 (on Parra's figure).—STORER, Syn. Fish., N. Am., 1840, 27.—GÜNTHER, Cat. Fish. Brit. Mus. i, 1861, 57, note 19.—POEY, Rep. Fis.-Nat. Cuba, i, 1867, 200.

Trisotropis cardinalis, POEY, op. cit. ii, 282; Annals Lyc. Nat. Hist. N. Y. ix, 1870, 303.

Serranus rupestris, CUV. & VAL., op. cit. ix, 1833, 437.—STORER, op. cit. 29.—GÜNTHER, op. cit. 145.

With some doubt I refer to this species the Red Rock-fish of the Bermuda market. In habits, form, and dimension, it much resembles the preceding. It is recorded from Saint Bartholomews, Cuba, and San Domingo, and at the latter place is called by the same name as in Bermuda.

EPINEPHELUS STRIATUS, (*Bloch*) *Gill.*

HAMLET; GROUPER.

Cherna, PARRA, Desc. Dif. Piez. Hist. Nat. Cuba, 1787, 50, lam. xxiv.

Anthias striatus, BLOCH, Ichth. ix, 1797, 109, tab. 324 (on a figure by Plumier).

Lutjanus striatus, LACÉPÈDE, Hist. Nat. Poiss. iv, 1803, 324.

Serranus striatus, CUV & VAL., Hist. Nat. Poiss. ii, 1829, 288.—STORER, Syn. Fish. N. Am. 1846, 27.—GUICHENOT, Sagra's Hist. Nat. Cuba, Poiss. 1850, 12.—GÜNTHER, Cat. Fish. Brit. Mus. i, 1861, 110.

Epinephelus striatus, GILL, Proc. Acad. Nat. Sci. Phila. 1865, 105.—POEY, Rep. Fis. Nat. Cuba, ii, 1868, 285.—COPE, Trans. Am. Phil. Soc. 1870, 466.

Anthias cherna, SCHNEIDER, Bloch, Syst. Ichth. ed. 1801, 310 (on Parra's figure).

Sparus chrysomelanurus, LACÉPÈDE, op. cit. 160. (on a bad copy of Plumier's figure).

Very common; found also throughout the Caribbean Sea and the Gulf of Mexico. The Grouper attains an enormous size; and, on account of its abundance and the ease of capturing, it is used as food more than any other species. Its flesh is rather inferior in flavor and coarse in texture, especially that of large individuals. Great numbers are caught off the islands, and are brought in the wells of the smacks to the artificial ponds along the shore, where they are kept for the market, and are fed on fish and lobsters.

The "Devil's Hole" is a large natural pool near the center of the main island, and about one hundred feet from the south shore of Harrington Sound. Here a large number of Groupers may usually be found confined, and the place is much visited by strangers. At feeding-time, when one looks into the clear waters of the pool, nothing can be seen but an array of great open mouths. When the food is thrown in, a scene of indescribable commotion and splashing ensues. They are very fierce, and rush savagely at anything which looks eatable. I have seen two large ones, each four feet in length, seize the opposite ends of a cuttle-fish arm tugging for several minutes at the tough morsel before the question of ownership could be decided.

The young fish are called Hamlets; but, after reaching a length of eighteen or twenty inches, are known as Groupers; the latter name is a corruption of the Portuguese *Garoupa*, which is applied to a similar fish found at Madeira.

Color.—Adult fishes range from a light-slate color to a deep chestnut-brown. In some individuals a narrow band of black extends from the tip of the snout to a point between the eyes, where it divides; the branches extending, one to the origin of the dorsal and the other to the angle of the operculum, and upward to unite with the first at the origin of the dorsal. The lips and throat are bright vermilion.

A great variation is apparent in the color of different individuals, which has not yet been satisfactorily explained, though it is no doubt due to the depth of water or color of the bottom in the place where they are taken, as is suggested below under *Enneacentrus punctatus*. The fishermen claim that the color of individuals confined in the ponds changes from one extreme to the other within the period of a few weeks. I have myself seen very considerable variation in color in the course of a week in fishes confined in shallow fish-ponds. The young fish are always slate-color and are also marked with six or seven broad, transverse bands of light brown and a large quadrangular black blotch across the back of the tail behind the dorsal.

EPINEPHELUS GUTTATUS, (*Gmelin*) *Goode*.

HIND.

? *Cugupuguacu*, Marcgrave, Hist. &c. Brasil, 1648, 169.—Sloane, Voyage aux Îles de Madère, des Barbades, de St. Christophe, et de la Jamaique, 1727, tab. ccxlvii.—

Cugupuguacu Brazil, Catesby, Nat. Hist. Carolina, Florida, and Bahamas, ii, 1743, 14, tab. xiv (the Hind).

Perca guttata, Gmelin, Linné, Syst. Nat. 1, 1788, 1315 (on a figure by Catesby).—Cuv. & Val., Hist. Nat. Poiss. ii, 1828, 372.

Bodianus apua, Bloch, Ichth. vii, 1797, 37, tab. ccxxix (on a figure by Prince Maurice).—Lacépède, Hist. Nat. Poiss. iv, 1803, 296.

? *Serranus apua*, Cuv. & Val., op. cit. 287 (citing as a synonym *Piratiapia*, Marcgrave, op. cit. 158).

Serranus apua, Günther, Cat. Fish. Brit. Mus. i, 1861, 140.

Bodianus marginatus, Schneider, Bloch, Syst. Ichth. 1801, 331.

Very common; recorded also from Jamaica, and probably from Brazil. The Hind is readily sold in the market, where specimens two feet in length are sometimes seen.

The name Hind perhaps refers to the spotted markings as similar to those of the deer. The name is found in nearly all the English West Indian islands, applied to the spotted species of this family.

Color.—Brownish, red, or rosy-white, with numerous small circular spots of deep rose-color, fading to brown in spirits. Vertical fins broadly margined with black.

The Hind is subject to great variations of color, specimens from the "white water", where there is a bottom of white sand, being nearly white, while others have the ground-color a dusky reddish-brown.

The descriptions of Gmelin and Bloch were both founded upon drawings, and their relations are somewhat doubtful. The former has been preferred, since the figure of Catesby agrees precisely with the Bermuda "Hind", except in the smaller number of dorsal spines, a matter of detail not likely to have been noticed by Catesby, judging from his other figures. The Bermudian form is much more likely to be identical with that from the Bahamas and Jamaica than that from Brazil, if, indeed, they are not all identical. Günther records from Jamaica his *Serranus apua*, which is, beyond a doubt, the Bermuda species, thus furnishing another argument for its identity with that figured by Sloane.

ENNEACENTRUS PUNCTATUS, (*Linné*) *Poey.*

BUTTER-FISH or CONEY (*yellow variety*); NIGGER-FISH (*red variety*).

Carauna, MARCGRAVE, Hist. &c. Brasil, 1648, 147.—LICHTENSTEIN, Abhandl. Akad. Berl. 1820–1, 278.

Perca marina puncticulata (Negro-fish), CATESBY, Nat. Hist. Carolina, Florida, and Bahamas, ii, 1743, 7, pl. vii.

Perca punctata, LINNÉ, Syst. Nat. ed. 10, i, 1758, 291; ed. 12, 1766, 485 (on Catesby's figure).

Enneacentrus punctatus, POEY, Rep. Fis.-Nat. Cuba, ii, 1868, 288.

Guativere, PARRA, Descr. Dif. Piez. Hist. Nat. Cuba, 1787, 7, lam. v, f. 1, 2.

Holocentrus auratus, BLOCH, Ichth. vii, 1792, 57, tab. ccxxxvi.—SCHNEIDER, Bloch, Syst. Ichth. 1801, 314.

Gymnocephalus ruber, SCHNEIDER, op. cit. 346, tab. lxvii (on a figure by Prince Maurice).

Serranus ouatalibi, CUV. & VAL., Hist. Nat. Poiss. ii, 1829, 381.—STORER, Syn. Fish. N. Am. 1846, 56.—GUICHENOT, Sagra's Hist. Nat. Cuba, Poiss. 1845, 15.—MÜLL. & TROSCH., Schomburgh's Hist. Barbados, 1848, 665.—GÜNTHER, Cat. Fish. Brit. Mus. i, 1861, 120.—POEY, op. cit. 202.—COPE, Trans. Am. Phil. Soc. Phila. 1870, 446.

Epinephelus ouatalibi, GILL, Proc. Acad. Nat. Sci. Phila. 1865, 105.

Bodianus guativere, SCHNEIDER, Syst. Ichth. Bloch, 1801, 336 (on Parra's figures).

Serranus guativere, CUV. & VAL., op. cit. 383 (limited to Parra's f. 2).—STORER, l. c.—MÜLL. & TROSCH., l. c.—COPE, l. c.

Serranns carauno, CUV. & VAL., op. cit. 384 (on a drawing by Prince Maximilian).—CASTELNAU, Anim. Nouv. ou Rares, Amérique du Sud, Poiss. 1, pl. 1, fig. 1.

Common; recorded also from the West Indies, Brazil, and the Cape Verde Islands. Its small size and the softness of its flesh render it of little economic value. In this species, as in the preceding, the range of color is very great; some individuals are orange-yellow, with blue spots confined to the head and anterior part of the body; others are red, slightly dingy above, and thickly studded throughout with black dots, each of which has a blue center. The specimens examined were not very fresh; and, from the rapidity with which the colors change, I can readily believe that in life they were as brilliant as is indicated in the description of Cuvier.* The yellow form corresponds to the typical *Perca punctata* or *Serranus guativere*, and is known as the Butter-fish or Yellow Coney; the red form corresponds to *Serranus ouatalibi*, and is known as the Nigger-fish.

Professor Poey suggests that the former inhabits shallow and the latter deep waters, and thus explains the variations of color. These would seem, however, to depend more upon the color of the bottom than upon the depth. On the coast of Maine, the bright-red variety of the Cod (*Gadus morrhua*, Linné) is found only on bottoms covered with Red Algæ, such as *Ptilota serrata*, *Delesseria sinuosa*, and *Rhodymenia palmata*.

The names Butter-fish and Nigger-fish are in use also at Barbados, Saint Thomas, and the Bahamas, as applied to this and an allied species. The first refers to the color and soft, oily feeling of the yellow variety; the latter probably also to color.

The Black Hind, Prickly Hind, and Black Coney are probably allied species, but not having seen them I can only surmise their character.

A "Soap-fish" also occurs, probably either *Rhypticus saponaceus* (Bloch) Cuvier, or *Promicropterus maculatus* (Holbrook) Gill.

HYPOPLECTRUS PUELLA, (*Cuvier*) *Gill.*

CATAPHEBE.

Plectropoma puella, CUV. & VAL., Hist. Nat. Poiss. ii, 1829, 405, pl. xxxvii.—GUICHENOT, Sagra's Hist. Nat. Cuba, Poiss. 1845, 18.—STORER, Syn. Fish. N. Am. 1846, 31.—POEY, Mem. Hist. Nat. Cuba, i, 1852, 62, lam. ix, f. 2.—GÜNTHER, Cat. Fish. Brit. Mus. i, 1861, 165.

Hypoplectrus puella, GILL, Proc. Acad. Nat. Sci. Phila. 1862, 236.—POEY, Rep. Fis.-Nat. Cuba, ii, 1868, 290.

Plectropoma vitulinum, POEY, Mem. Hist. Nat. Cuba, i, 1852, 68.

Common in the rock-pools; recorded also from Martinique and Jamaica. My specimen measures three inches. The name seems to be peculiar to Bermuda, and its origin is not apparent.

Color.—Olive, with six violet-black cross-bands; the third very broad and conspicuous and below the fourth and tenth dorsal spines. A fine around the orbit, another from posterior nostril across anterior edge of orbit to lower limb of preoperculum, then broken, then continued to base of ventral; and two others across the operculum; the anterior extending over the base of pectoral to belly, blue. Several blue spots between the orbit and snout. Fins yellowish.

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* Cuvier and Valenciennes, Histoire Naturelle des Poissons, ii, 381

ECHENEIDIDÆ.

Fishes of this family are freqently taken, clinging to sharks or to the shells of turtles.* The sharks thus encumbered are frequently much emaciated. *Leptecheneis naucrates* (Linn.) Gill, *L. naucrateoides* (Zuiew) Gill, and *Ptheirichthys lineatus* (Menz.) Gill are probably the most common species of "Suck-fish" found here.

SPHYRÆNIDÆ.

SPHYRÆNA SPET, (*Haüy*) *Goode.*

BARRACUDA.

Esox dorso dipterygio LINNÉ, Mus. Ad. Fried. ii. 1754, 100.

Esox sphyræna, LINNÉ, Syst. Nat. ed. 10. i, 1758, 313, ed. 12; i, 1766, 115; GMELIN, Linné, Syst. Nat. i, 1788, 1389.—BLOCH, Ichth. xi, 1797.

Sphyrna sphyræna, BLOCH, Ichth. 1797, taf. ccclxxxix.—SCHNEIDER, Bloch, Syst. Ichth. 1801, 109.—RISSO, Ichth. Nice, 1810, 332.

Esox spet, HAÜY, Encyclopédie Méthodique, iii, Poissons, 7187.

Sphyræna spet LACÉPÈDE, Hist. Nat. Poiss. v, 1803, 326-8.—? BONAPARTE, Iconografia della Fauna Italica, iii, Pesci, plate with part 152.

Sphyræna becuna, LACÉPÈDE, op. cit. 327-9, pl. ix, f. 1.—CUV. & VAL., Hist Nat. Pois. iii, 1829, 340 (part); and vii, 1831, 507.

Sphyræna vulgaris, CUV. & VAL., op. cit. iii, 1829, 327.—GÜNTHER, Cat. Fish. Brit. Mus. ii, 1861, 334.

Sphyræna viridensis, CUV. & VAL., sc., op. cit. 339.

Common; frequently found in the markets, and eaten with impunity, as far as I could learn. My specimens measured nearly two feet, and it is said to attain a much greater size. This is not the Barracuda of the West Indies, but the common species of the Mediterranean known by the Spanish as *Espeto* and by the Italians as *Sfirena* and *Luzzo.* Its occurrence so far west has, I believe, never before been observed. Günther considers the *Sphyræna borealis* of DeKay,[*] described from specimens eight inches long taken in New York Harbor, to be the same. This might be inferred from the somewhat loose language of the description; but the figure shows it to be closely allied to, if not identical with, *Sphyræna picuda.* The origin of the first dorsal is shown by the artist to be situated almost directly above the extremity of the pectorals and far in front of the middle of the fish. The locality, New York, given by Dr. Günther for his specimen "purchased of Mr. Brandt" must, I fear, be placed in the same category with that of Lake Champlain given for specimens of *Chilomycterus geometricus* and *Tetrodon turgidus*,[†] and with some of the cases of reptiles described as North American by Duméril and Bibron from collections professedly North American.

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* All four species of the pelagic turtles of the Atlantic are common, and were observed by me, viz:—*Sphargis coriacea*, *Chelone mydas*, *Eretmochelys imbricata*, and *Thalassochelys caouana.* These, with a small saurian, *Eumeces longirostris*, Cope, make up the reptilian fauna of the Bermudas.

SPHYRÆNA PICUDA, *Schneider.*

SENNET.

Barracuda, SLOANE, Voyage aux îles de Madère et de la Jamaique, ii, 1727, 185, pl. ccxlvii, f. 3.

Umbla minor marina maxillis longioribus (Barracuda), CATESBY, Hist. Carolina, Florida, and the Bahamas, ii, 1743, 1, tab. 1.

Picuda, PARRA, Descr. Dif. Piez. Hist. Nat. Cuba, 1787, 90, lam. xxxv, f. 2.

Sphyræna sphyræna, var. *picuda*, SCHNEIDER, Bloch, Syst. Ichth. ed. 1801, 110, tab. xxix, f. 1.—MÜLLER & TROSCHEL, Schomburgk's Hist. Barbados, 1848, 667.—GÜNTHER, Cat. Fish. Brit. Mus. ii, 1861, 336.

Esox barracuda, SHAW, Gen. Zool. v, 1804, 105.

Sphyræna barracuda, CUV. & VAL., Hist. Nat. Poiss. iii, 1829, 343, pl. lxvi.—STORER, Syn. Fish. N. A. 1846, 47.—MÜLLER & TROSCHEL, l. c.—COPE, Trans. Am. Phil. Soc. Phila. 1870, 472.

Common; breeding plentifully. The young may be seen basking in the sun in the shallows, where they are seined in large numbers. My largest specimens measured over two feet in length. Both this and the preceding species are eaten with impunity, though the former is regarded with suspicion on the Mediterranean and the latter has to answer for several well-attested cases of *ciguatera*, though in some of the West India Islands it is eaten freely.

The popular name is also in use at Barbados, where it is applied to the same or an allied species. Schomburgk spells it *Sinnet.*

The species of this genus are not yet very accurately defined. Professor Cope[‡] takes exception to the supposed identity of *S. picuda* and

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[*] Zoology of New York, Fishes, 39, pl. lx, f. 196.

[†] Cat. Fish. Brit. Mus. viii, 285.

[‡] Proc. Amer. Phil. Soc. Phila. 1870, 472.

S. barracuda. The latter may be easily distinguished from the preceding by observing the situation of the first dorsal. In *S. spet*, this begins in the middle of the body and far behind the extremity of the pectorals; in *S. picuda*, on the anterior half of the body and above the extremity of the pectorals. The first is much the slenderer, and has nearly double the number of scales in the lateral line.

TRACHYPTERIDÆ.

REGALECUS GLADIUS, (*Walbaum*) *Cuv. & Val.*

Spada marina, Imperati, 587.

Cepola gladius, Walbaum, Artedi Gen. Pisc. iii, 1792, 617.

Regalecus gladius, Cuv. & Val., Hist. Nat. Poiss. x, 1835, 352, pl. ccxcviii—Günther, Cat Fish. Brit. Mus. iii, 1861, 308.—Hutton, Fishes of New Zealand, 35.

Gymnetrus longeradiatus, Risso, Hist. Nat. Eur. Merid. iii, 1827, 296.

? *Gymnetrus capensis*, Cuv. & Val., op. cit. 376.

Regalecus Jonesii, Newman, Zoologist, 1860, 7019.

This is the great "Sea-serpent" which came ashore at Hungary Bay in the winter of 1860, the capture of which has been recorded by Mr. J. Matthew Jones.*

Portions of this specimen, which measured 16 feet and 7 inches in length, are preserved in the British Museum.

This specimen is thought by Günther to "probably belong" to the species given above. The well-identified specimens of the species are all from the Mediterranean, the largest 9½ feet long, while the relations of the specimens from New Zealand and the Cape of Good Hope are conjectural. The data are not sufficient to warrant the adoption of Newman's species, founded on the Bermuda specimen as a good one.

MUGILIDÆ.

MUGIL LIZA, *Valenciennes.*

Mullet.

Mugil liza, Cuv. & Val., Hist. Nat. Poiss. xi, 1836, 86.—Jenyns, Zool. Voyage H. M. S. Beagle, Fish, 80.—Günther, Cat. Fish. Brit. Mus. iii, 1861, 423.—Poey, Rep. Fis.-Nat. Cuba, ii, 1868, 388

Very common, especially in Hamilton Harbor and other shallow bays; breeding. They are seined, and brought to market in large numbers.

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* Bermuda Royal Gazette, Jan. 24 and Jan. 31, 1860.—Proc. Zool. Soc. London, 1860, 185.

I have some hesitation in referring the Bermuda Mullet to this species, though it appears to be identical with that taken at Bahia Blance and Monte Video by Darwin and described by Jenyns.* Poey considers his *Mugil lebranchus*† separated from this species by characters of doubtful value.

BELONIDÆ.

The Hound-fish of the fishermen is a *Belone;* but as I could get no specimens for careful examination, it is not possible to say to which of the nineteen West India species it belongs, or whether two or three species are not confounded under the same name.

SCOMBERESOCIDÆ.

HEMIRHAMPHUS PLEII, *Valenciennes.*

GAR-FISH.

Hemirhamphus Pleii, Cuv. & Val., Hist. Nat. Poiss. xix, 21, 1846.—Günther, Cat. Fish. Brit. Mus. vi, 268.—Cope, Trans. Am. Phil. Soc. Phila. 1870, 481.

Common; recorded also from various points in the West Indies and from Bahia. The Gar-fish occurs in enormous schools, and is seined in quantity for the market. I observed two sizes, the smallest averaging eight inches, the larger twenty inches. The fish of different sizes swam in separate schools.

The name *Gar*, applied so indiscriminately to fishes with long slender beaks, is probably the old Saxon word *gar*, which means a weapon, a lance. The name Half-beak usually given to fishes of this family is much more appropriate.

EXOCŒTUS EXILIENS, *Gmelin.*

Exocœtus exiliens, Gmelin, Linné, Syst. Nat. 1, 1788, 1400.—Cuv. & Val., Hist. Nat. Poiss. xix, 1846, 114.—Richardson, Fauna Boreali-Americana, iii, 129.—Günther, Cat. Fish. Brit. Mus. vi, 1861, 291.—Gill, in Baird's Rep. on Sea Fisheries of Southern New England, 809.

Exocœtus fasciatus, Lesueur, Journ. Acad. Nat. Sci. Phila. ii, 1821, 8, pl. iv, f. 2.

A single specimen was brought me March 1 by some negro fishermen who had caught it in Hamilton Harbor by holding a tin pail ("kettle") under it when it leaped from the water. I kept it alive for some hours, and had an opportunity to observe its motions. Its favorite position was on the bottom of the dish, where it would remain with its pectorals and ventrals widely expanded, looking very like a large butterfly sunning itself on a flower. When disturbed, it would fold its fins close to the sides of its body, and swim about with great velocity by rapid, long, sweeping strokes of the tail and posterior half of the body. The extent to which it flexed its body was quite remarkable, almost reminding one of the motions of a Shark. When much excited, it would rise into the air with a sudden spring, its pectorals and ventrals expanded, seeming to have no difficulty in leaving the water in a space less than a foot in diameter: I am inclined to believe that the impetus from the action of the caudal is all that is used in leaving the water, and that the motion of the pectorals in flying-fishes is not begun until the fish is fairly in the air. It seemed very timid and watchful, and any quick motion of the hand within its sight would start it into rapid, nervous action.

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* Zool. Voyage H. M. S. Beagle, Fish, 1842, 80.

† Memorias sobre la Historia Natural de la Isla de Cuba * * * ii, 1861, 260, tab. 18, f. 3; Rep. Fis.-Nat. Cuba, ii, 1868, 388.

The figures given by Lesueur and Edwards* are very accurate; but all published descriptions fail to mention the most striking character, viz, the deep notch in the membrane between the second and third pectoral rays, which seems the more apparent from the fact that the second ray is longer than the third, and projects in a spine-like process; the membrane between the third and fourth rays is slightly emarginate. The fourth ray is much the longest and the rays posterior to that regularly decrease in length.

The Bermuda fishermen recognize two kinds of flying-fish, the pelagic variety and this, which they believe to live among the sea-weed and seldom leave the water. The specimens of this species on record are all quite small: Gmelin describes his as "*at vix digito longior*"; Lesueur's was three inches long; Valencienne's was "*petite*"; and Edwards's figure indicates that his was diminutive. They may prove to be the young of some other species; but this is not probable, since no other form has pectorals of such peculiar form. The absence of barbels, if this be a character of immature *Exocœtidæ*, is also noteworthy.

A detailed description is given below:—

Radial formula: D. 12; A. 12; P. 18; V. 6; L. lat. 48.

The body is slender, its height being less than one-eighth (0.12) of the total length. Viewed from above, its outline is that of a narrow wedge, with its base at the nape and its apex at the extremity of the lower caudal lobe. The greatest width of the body is at the nape, where it is equal to the greatest height, which occurs at the same point. The length of the head is one-sixth (0.17) of total length, and its greatest width equals that of the body. The orbit is circular, and its diameter equals the interorbital space, which is half the length of the head. The snout is very short, equaling one-sixth the length of the head; the lower projects far beyond the upper jaw. The interorbital space is deeply concave. The dorsal and anal fins begin at a point slightly behind the middle of the body, and are nearly alike in shape and in the length of the base and of the longest rays. The pectorals measure three-fifths (0.58) of the total length, extending nearly to the base of the caudal fin. The first ray is half as long as the second, which projects far beyond the margin of the membrane in a spine-like process; the third ray equals the second, while the fourth is much longer. The membrane between the second and third rays is deeply, between the third and fourth slightly, emarginated. The rays succeeding the fourth gradually decrease in length. The ventrals begin slightly in advance of the middle of the body, in length equaling a third (0.31) of total length. The five posterior rays are bifid nearly to the base. The tips of ventral and pectoral fins are equidistant from the snout. The upper lobe of the caudal measures two-thirds the length of the lower lobe.

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* Gleanings in Natural History, pl. ccx.

Color.—Back bluish, shading into the silvery white of the belly; five broad lateral transverse bands. The snout transparent white. Two yellow spots upon the nape. Pectorals and ventrals black at base and at margin, and with broad, irregular bands and blotches of black and dark blue; where unspotted, clear, colorless, and transparent. Caudal lobes each with a terminal spot of black; the lower with spot of same color on its outer margin half-way from the body to its extremity.

Extreme length, $0^{m}.073$	100
Body:	
Greatest height	.12
Greatest width	.12
Height at ventrals	.10
Height of tail behind dorsal fin	.06
Head:	
Length	.17
Distance from snout to nape	.15
Greatest width	.12
Width of interorbital area	.10
Length of snout	.03
Eye:	
Diameter	.08

Dorsal:	
Distance from snout	.56
Length of base	.13
Greatest height	.13
Anal:	
Distance from snout	.56
Greatest height	.14
Caudal:	
Length of upper rays	.15
Length of lower rays	.23
Pectoral:	
Distance from snout at upper axilla	.16
Length	.58
Distance of tip from snout	.80
Ventral:	
Distance of base from snout	.45
Length	.32
Distance of tip from snout	.78

The *Exocœtus exiliens* of Bloch is totally different.

I observed numerous specimens of the pelagic species in the vicinity of the islands, both on going and return. I take from my note-book some observations on their flight.

"*February* 10, 1871.—Several flying-fishes were observed on approaching the islands; usually they were single, but often a school of half a dozen or more started out from under the side of the brig. The distance of flight varied from six to one hundred yards. When they leave the water, the pectorals assume a rapid vibration, reminding one of the flight of a grouse, the tail also rapidly vibrating. The fins soon assume a rigid position, and the fish rises over the crests and falls in the trough of the waves, following their motion; sometimes it dashes through the crest, and on re-appearing the fins are again in motion. They seem unable to fly except in a straight line (I afterwards saw them veering considerably from a straight line, taking a direction nearly at right angles with their first course), but are not dependent on the direction of the wind. The motion is very bird-like, but the illusion is dispelled by the decidedly piscine splash with which the fish plunges into the water. It was a truly beautiful sight as the fishes emerged from the waves, their silvery fins quivering and glistening in the light."

I am convinced that at the moment the fish leaves the water the mode of propulsion changes from a true swimming motion to a true flying motion. The leap with which it leaves the water is due to the former, and is analogous to the spring from the ground or from a perch, made by some birds in the act of taking wing.

CYPRINODONTIDÆ.

FUNDULUS BERMUDÆ, *Günther.*

Fundulus Bermudæ, GÜNTHER, Ann. & Mag. Nat. Hist., 1874.

Very common in the brackish water of the swamps and in ditches. Attains the length of four inches.

SYNODONTIDÆ.

SYNODUS LACERTA, (*Valenciennes*) *Goode.*

SNAKE-FISH.

Salmo Saurus, LINNÉ, Syst. Nat. 2 ed. 11, 511, 1766; Gmelin, Syst. Nat. 1, 1376.

Saurus lacerta, CUV & VAL., Hist. Nat. Poiss. xxii, 463, 1849 (not Risso).

Saurus griseus, LOWE, Trans. Zool. Soc. ii, 188, 1841.—GÜNTHER, Cat. Fish. Brit. Mus. v, 395.

A specimen, seventeen inches long, was taken off the "ducking-stool" in March, by a line fisherman. Its occurrence in this part of the Atlantic is very novel, but it agrees closely with a specimen of *Saurus griseus* sent to the United States National Museum by Dr. Günther. Its color was dusky-gray above, yellow below. Its formulæ are as follows:—

Branchiostegals, 16–17 (on opposite sides). D. 12; A. 12. Lateral line, 60. Transverse line, $\frac{3\frac{1}{2}}{6}$.

ELOPIDÆ.

MEGALOPS THRISSOIDES, (*Bloch*) *Günther.*

TARPUM.

Camaripucuagu, MARCGRAVE, Hist. &c. Brasil, 1648, 179.

Clupea cyprinoides, BLOCH, Ichth., xii, 1797, 24, tab. cccciii.

Clupea thrissoides, SCHNEIDER, Bloch, Syst. Ichth. 1801, 424.

Megalops thrissoides, GÜNTHER, Cat. Fish. Brit. Mus. vii, 1868, 472.—GILL, in Baird's Rep. on Sea Fisheries of Southern New England, 1873, 810.

Clupea apalike, HAÜY, Encyclopédie Méthodique.—LACÉPÈDE, Hist. Nat. Poiss. v, 1803, 425, 461.

Clupea gigantea, SHAW, Gen. Zool. v, 1803, 173.

Megalops atlanticus, CUV. & VAL., Hist. Nat. Poiss. xix, 1846, 398.—MÜLLER & TROSCHEL, Schomburgk's Hist. Barbados, 1848, 676.—POEY, Rep. Fis.-Nat. Cuba, ii, 1868, 423.

Extremely rare; a single skin about six feet long was shown me in the collection of John T. Bartram, of Saint George's. The species is recorded from the Gulf of Mexico, Demerara, Trinidad, Guadaloupe, Santo Domingo, Porto Rico, Martinique, and Cuba.

The species is very abundant on the eastern coast of Florida and in the Saint John's River, where it is known as the Jew-fish. Several specimens were taken on the southern coast of New England and New York in 1874.

The name is inexplicable, but may have some connection with the name "Caffum", which is given to the same fish in Barbados.

CLUPEIDÆ.

SARDINELLA ANCHOVIA, *Valenciennes.*

ANCHOVY.

Sardinella anchovia, CUV. & VAL., Hist. Nat. Pois. xx, 1847, 269.

Clupea anchovia, GÜNTHER, Cat. Fish. Brit. Mus. vii, 1868, 421.

I refer with some doubt to this species a small fish which occurred in great schools during the month of March, and were seined together with *Decapterus punctatus*, and sold in quantities along the quay. Their average length was about five inches.

HARENGULA MACROPHTHALMA (*Ranzani*).

PILCHARD.

Clupea macrophthalma, RANZANI, Novi Commentarii Acad. Scient. Inst. Bononiensis, v, 1842, 320, tab. xxiii.—GÜNTHER, Cat. Fish. Brit. Mus. vii, 1868, 421.—COPE, Trans. Am. Phil. Soc. Phila. 1870, 483.

Harengula sardina, POEY, Mem. Hist. Nat. Cuba, ii, 1863, 310; Rep. Fis.-Nat. ii, Cuba. 1868, 418.

Common; also recorded from various islands in the West Indies. Great quantities were seined during the month of March, and sold from row-boats at the water's edge. Their average length was nine inches. Poey's *Harengula sardina* appears to be the same. The name is derived from England, where an allied species, *Clupea pilchardus*, Walbaum, is commonly known as "the Pilchard".

OPISTHONEMA THRISSA, (*Linné*) *Gill.*

HERRING.

Clupea minor, radio ultimo pinnæ dorsalis longissimo, BROWN, Civ. and Nat. Hist. Jamaica, 1756, 443.

? Clupea corpore ovato, LINNÉ, Amœn. Acad. v, 251.

Clupea thrissa, LINNÉ, Syst. Nat. ed. 10, 1, 1758, 318; ed. 12, 1, 1750, 524; GMELIN, Linné, Syst. Nat. 1, 1788, 1405 (part).—BROUSSONET, Ichth. 1, tab. x.—?BLOCH, Ichth. xii, 1797, 27, taf. cccciv (from a drawing by Plumier).—SCHNEIDER, Bloch, Syst. Ichth. ed. 1801, 424.—GÜNTHER, Cat. Fish. Brit. Mus. vii, 1868, 432.

Meletta thrissa, CUV. & VAL., Hist. Nat. Poiss. xx, 1847, 380.

Opisthonema thrissa, GILL, Proc. Acad. Nat. Sci. Phila. 1861, 37; Cat. Fish. E. Coast N. Am. 1861, 54; and in Baird's Rep. on Sea Fisheries of S. New England, 1873, 811.

Opisthonemus thrissa, POEY, Rep. Fis. Nat. Cuba, ii, 1886, 419.

Clupanodon thrissoides, SPIX, MÜLL., & TROSCH., Schomburgk's Hist. Barbados, 1848, 676.

Megalops thrissoides, AGASSIZ, in Spix's Selecta Gen. et Spec. Pisc. Brazil, 1829, 45, pl. xxii.

Megalops oglina, LESUEUR, Journ. Acad. Nat. Sci. Phila. 1, 1817, 359.

Chatoessus oglina, GRIFFITH, Cuvier's Animal Kingdom, x, 1835, 439.—DEKAY, New York Fauna, Fishes, 1842, 265.—STORER, Syn. Fish. N. Am. 1846, 209.

Chatoessus signifer, DEKAY, op. cit. 264, pl. xli, f. 132.—STORER, op. cit. 210.—BAIRD, Fishes of New Jersey Coast, 1855, 35.—JONES, Naturalist in Bermuda, 103.

Chatoessus eumorphus, GOSSE, Naturalist's Sojourn in Jamaica, 1851, 290 (notes).

This species was taken in great numbers during the month of March. They occurred in schools in two distinct sizes; the smaller, perhaps the young of the previous year, measured four inches on an average; the adults, ten. The species is common in the West Indies, and has been taken as far north as Newfoundland.

ENGRAULIDIDÆ.

ENGRAULIS CHŒROSTOMUS, *Goode.*

HOG-MOUTH FRY.

Engraulis chœrostomus, GOODE, Amer. Journ. Science and Arts, viii, 1874 (Aug.), 125.

Common in the bays in large schools; used extensively for bait. Its enormous mouth has given it the name of "hog-mouth fry."

This species closely resembles *Engraulis surinamensis* (Blkr.) Günther, differing from it, however, in several respects. The height of the body (0.16) is a little greater than two-thirds of the length of the head, and is contained six times in the total length, and slightly more than four times in the length to the end of middle caudal rays (0.90); the height at the ventrals is less (0.13). The scales are large, in thirty-eight oblique rows between the head and the caudal. The length of the head (0.22) is less than one-fourth of the total, and is double its height at the pupil (0.11); its greatest width (0.08) is about one-third of its length. The orbit is nearly circular, and its diameter (0.05) equals the length of the snout (0.05) and the width of the interorbital area (0.05). The snout projects far beyond the lower jaw, the extremity of which just passes the vertical from the anterior margin of the orbit. The maxillary is dilated above the mandibular joint, rather tapering behind, and extends to the gill-opening. The gill-rakers are fine, setiform, not longer than the eye (0.05); about twenty-five on the lower branch of the outer branchial arch.

The origin of the dorsal fin is in front of the middle of the body (0.45 from the snout), and directly above the extremities of the ventrals. The length of the first ray (0.06) is half that of the second (0.12), which nearly equals the length of the base (0.11). The origin of the anal is at the middle of the body (0.51 from the snout), and below the posterior dorsal rays; its greatest height (0.11) nearly equals that of the dorsal. The length of the middle caudal rays (0.08) is two-fifths of that of the outer rays (0.20). The length of the pectorals (0.11) equals the length of the base of the dorsals (0.11), the extremities reaching to the origin of the ventrals. Length of ventrals, 0.09; and their distance from snout, 0.35.

Color:—Back and sides brownish; belly white; a broad, clearly-defined lateral band of silver as wide as the diameter of the orbit (0.05).

Radial formula:—D. 13–14, A. 23-24. Length, 2.68 inches ($0^{m}.63$).

CYPRINIDÆ.

CARASSIUS AURATUS, (*Linné*) *Bleeker*.

GOLD-FISH.

Cyprinus auratus, LINNÉ, Syst. Nat. ed. 10, i, 1758, 323.—JONES, Naturalist in Bermuda. 1863, 103.

Carassius auratus, BLEEKER, Cyprin. 255.—GÜNTHER, Cat. Fish. Brit. Mus. vii, 1868, 32,

Common in the brackish water of the ditches. Mr. Jones states that it was introduced from Demerara many years ago.

ANGUILLIDÆ.

ANGUILLA BOSTONIENSIS, (*Lesueur*) *Ayres*.

EEL.

Murœna bostoniensis, LESUEUR, Journ. Acad. Nat. Sci. Phila. i, 1817, 81.

Anguilla bostoniensis, AYRES, Boston Journ. Nat. Hist. iv, 1842, 279.—GÜNTHER, Cat. Fish. Brit. Mus. viii, 1870, 31.—GILL, in Baird's Rep. Sea Fisheries Southern New England, 1873, 811.—BAIRD, Rep. Sea Fisheries Southern New England, 1871, 826.

Common in the ditches and dikes of the salt-marshes. Mr. Jones states* that it attains the weight of two or three pounds, and is very destructive to young ducklings. It is not eaten.

I obtained a specimen measuring five inches, which I refer with some hesitation to the above species, as measurements made from specimens contracted by strong alcohol are not satisfactory. The length of the head is contained once and a half in the distance between the gill-opening and the dorsal, twice in the distance between the gill-opening and the vent. The distance between the origins of the dorsal and anal is contained once and a half in the length of the head.

MURÆNIDÆ.

GYMNOTHORAX MORINGA, (*Cuvier*) *Goode.*

SPECKLED MARAY.

Muræna maculata nigra (Black Murey), CATESBY, Nat. Hist. Carolina, Florida, and Bahamas, ii, 1743, 21, tab. 21, 174.

Muræna moringa, CUVIER, Regne Animal, 1817.—STORER, Syn. Fish N. Am. 1846, 235

Muræna moringua, RICHARDSON, Voy. H. M. S. S. Erebus & Terror, Ichth. 1846, 89.—KAUP, Cat. Apod. Fish. Brit. Mus. 1856, 89.

Gymnothorax rostratus, AGASSIZ, in Spix's Selecta Gen. et Spec. Brasil, 1829, 91, tab. 1, *a.*—MÜLL & TROSCH . Schomburgk's Hist. Barbados, 1848, 676.—POEY, Rep. ii, 1860-1, 259, 427.—COPE, Trans. Am. Phil. Soc. Phila. 1870, 483.

Murenophis rostratus, CASTELNAU, Anim. Nouv. ou Rares, Amérique du Sud, 1855, 80, pl. xlii, f. 1.

Murenophis curvilineata, CASTELNAU, op. cit. 81, pl. xlii, f. 2.

Occasional: the species occurs throughout the West Indies, at Bahia and at Saint Helena. My specimen measures three feet, and has the vertical fins edged with white. These fishes are said to attain a length of five or six feet, and are considered excellent food by the lower classes: I am told, however, that serious cases of poisoning have been occasioned by their use. The Speckled Maray is not rare, but by no means as common as the Green Maray. I saw a single specimen of the latter, but as I could not obtain it for study I was unable to determine its specific relations. It resembles closely the "Muray" of Catesby,† which I have reason to believe is not identical with his "Black Muray", as is generally supposed.

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* Naturalist in Bermuda, p. 103.

† Nat. Hist. Carolina, Florida, and Bahamas, 20, pl. xx—*Muræna maculata nigra and viridis.*

ECHIDNA CATENATA, (*Bloch*) *Blecker.*

Gymnothorax catenatus, BLOCH, Ichth. xii, 1797, 69, taf. ccccxv.
Muræna catenata, RICHARDSON, Voyage H. M. S. S. Erebus & Terror, Ichth. 1846, 95.—GÜNTHER, Cat. Fish. Brit. Mus. viii, 1870, 131.
Pœcilophis catenatus, KAUP, Cat. Apod. Fish. Brit. Mus. 1856, 100.
Echidna catenata, BLEEKER, Ned. Tyds. Dierk. ii, 242.

Dr. Kaup (*l. c. sup.*) gives Bermuda as a locality for this species; it also occurs at many of the West India Islands, at Trinidad, and on the coast of Dutch Guiana at Surinam.

RAIÆ.

The names Sting Ray and White Ray would indicate the occurrence of one or more species of this order. *Ætobatis narinari* (Euphrasen) Müll. & Henle is likely to occur here.

LAMNIDÆ.

Mr. Jones records a specimen nearly eight feet long taken in March, 1850, which he believes to be the *Lamna punctata* figured by DeKay.*

SPHYRNIDÆ.

The Hammer-head Shark known to the fishermen is probably the *Sphyrna zygæna* (Linné) Müller & Henle.

SCYLLIIDÆ.

The large Shark confined in the Devil's Hole is probably *Ginglymostoma cirratum* (Gmelin) Müll. & Henle.

GALEORHINIDÆ.

MUSTELUS CANIS, (*Mitch.*) *DeKay.*

NURSE SHARK.

Squalus canis, MITCHILL, Trans. Lit. and Phil. Soc. N. Y., 1, 486, pl. lxiv, f. 209.
Mustelus canis, DEKAY, Zool. N. Y. Fish, 1842, 355, pl. lxiv, f. 209.—STORER, Syn. Fish. N. Am. 253.—BAIRD, Fishes New Jersey Coast, 39, 1854; Rep. U. S. Com. Fish, 1871, 827.—GILL, Cat. Fishes E. Coast N Am. 59; and in Baird's Rep. U. S. Com. Fish, 1871, 813.—POEY, Rep. Fis.-Nat. Cuba, ii, 453.

Common. My specimen measured three feet, and one of the oviducts contained a young one eight inches long. It agrees exactly with specimens of *Mustelus canis* from Wood's Hole, Mass.

The Nurse is considered excellent food; after it has been boiled until tender, and then fried in its own fat. The sharks are rarely eaten, however, except by the negroes.

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* Zoology of New York, Fish, 352, pl. lxiii, f. 206-207.

APPENDIX.

ADDITIONAL SPECIES OBSERVED BY MR. J. MATTHEW JONES.

After the preceding pages were in type, I received from Mr. Jones a list of the species collected by him in the Bermudas. In order to represent as fully as possible the present state of knowledge in reference to the fish fauna of these islands, I venture to give below the names of those species cited by Mr. Jones which have not fallen under my personal observation. Many species are of course included both in his collection and my own. The specific names below are given on the authority of Mr. Jones, who employs the nomenclature of Dr. Günther's "Catalogue of the Fishes in the British Museum".

LIST.

Diodon maculatus.
Tetrodon rostratus.
Ostracion trigonus.
Balistes maculatus.
Monacanthus aurantiacus.
Syngnathus Jonesii.
Centriscus, sp.
Fistularia serrata.
Rhomboidichthys lunatus.
Hemirhombus aramaca.
Lefroyia bermudensis.
Brotula barbata.
Centronotus, sp.
Blennius crinitus.
Gobius soporator.
Scorpæna Plumieri.
Scarus Catesbyi.
Pseudoscarus psittacus.
Pseudoscarus sanctæ-crucis.*
Platyglossus bivittatus.
Glyphidodon cælestinus.
Acanthurus chirurgus.
Chætodon capistratus.
Holacanthus tricolor.
Caranx dentex.
Caranx carangus.
Caranx chrysos.
Thyrsites prometheus.
Auxis Rochei.
Seriola Dumerilii.
Seriola zonata.
Trachynotus ovatus.
Coryphæna pelagica.
Coryphæna hippurus.
Mullus barbatus.
Sargus argenteus.
Mesoprion chrysurus.
Hæmulon macrostoma.

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* [Probably the young of *Pseudoscarus vetula;* see discussion on page 32, *supra.*]

Hæmulon xanthopterum.
Serranus coronatus.
Rhypticus saponaceus.
Apogon imberbis.
Priacanthus macrophthalmus.
Regalecus gladius.
Belone hians.
Exocœtus lineatus.
Saurus fœtens.
Saurus myops.
Albula conorhynchus.
Ophichthys acuminatus.
Muræna miliaris.
Muræna maculipinnis.
Muræna sanctæ-helenæ.
Acipenser sturio.*
Carcharias obscurus.
Ætobatis narinari.

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Department of the Interior:
U. S. NATIONAL MUSEUM.

— 5 —

BULLETIN

OF THE

UNITED STATES NATIONAL MUSEUM.

NO. 5.—CATALOGUE OF THE FISHES OF THE BERMUDAS.

BY

G. BROWN GOODE.

WASHINGTON:
GOVERNMENT PRINTING OFFICE.
1876.

THE SHORT POMPANO (*Trachynotus ovatus*). AND THE AMBER FISH (*Seriola sp*).

◆

U. S. Fish Commission, Fish and Fisheries,
Smithsonian Institution,
Washington, D. C., Feb. 7th, 1876.

Editor Forest and Stream:—

The pompanoes from Pensacola, Fla., referred to in your last issue, one of which was sent by Mr. Blackford to the National Museum, belong to a species not nearly so common on our coast as the *Trachynotus Carolinus*. The short pompano (*Trachynotus ovatus*) is easily distinguished by the greater height of its body, which is nearly or quite equal to the half of its length, and by the prolongations of the anterior rays of the dorsal and anal fins; the lobes of the caudal, dorsal, and anal are blackish, while the general hue of the body is more golden than in the ordinary species. The short pompano is cosmopolitan; it has been observed in Australia; in the seas of China and India; in the Moluccas and about Ceylon; in the Maylayan Peninsula and the Red Sea. It occurs on the coast of South America and in the West Indies. It is probably the "pompynose" of New Orleans, though the other species probably also occurs in those waters. While at Wood's Hole last Summer, the seining party of the United States Fish Commission took three specimens of this species at the head of Vineyard Haven (Holme's Hole) Harbor; these were very young, not exceeding one inch in length, and were preserved in the aquaria for some days.

Mr. Blackford has recently sent to the museum another interesting fish belonging to the genus *Seriola*, one of the *Cararigidæ*, and not very remotely related to the banded rudder-fish (*Halatractus zonatus*), which is frequently seen in our waters. It is very closely related to the fish known as the "amber fish" in the Bermudas, and as the "yellow tail" about St. Helena. This fish, which came from Key West, was forty-seven inches in length and weighed thirty-two pounds. Its specific relations are not yet determined.

G. Brown Goode.

Forest and Stream VI. 20

FEBRUARY 17, 1876.

Natural History of Florida.

The zoology of Florida is in many respects peculiar and is very different from that of any other portion of the United States. An effort is being made to secure for the new Zoological Garden in Philadelphia, as large a series as possible, of living animals from this State. Mr. G. Brown Goode, of the Smithsonian Institute, Washington, is making collections during a short visit to Florida. This garden has been made upon a portion of Government Park, Philadelphia, which has been granted by the commissioners of the park, for that purpose. The success of the undertaking—the first of the kind in the United States—has been extraordinary, even in comparison with the Zoological Gardens of Europe. Since the opening in July 1, 1874, up to the present time, over 200,000 persons have visited the collection. Should the society have continued success, the collection will form a very important and attractive feature in the Centennial Exposition of 1876, besides being at all times a useful means for encouraging the taste for and increasing the knowledge of Natural History. It is particularly desirable to obtain a large series of Florida reptiles, snakes and turtles, cranes, herons, ibises, pelecans and show birds generally, and fox-squirrels, wild hogs and manatees. Persons having opportunities to collect or having animals to dispose of, should communicate with G. Brown Goode, Arlington Bluffs, near this city.

B. No. 7.

International Exhibition, 1876.

BOARD ON BEHALF OF UNITED STATES EXECUTIVE DEPARTMENTS.

NATIONAL MUSEUM, SMITHSONIAN INSTITUTION.

COLLECTION TO ILLUSTRATE
THE

ANIMAL RESOURCES OF THE UNITED STATES.

CLASSIFICATION.

The following classification has been prepared by Mr. G. Brown Goode to facilitate the work of collecting and arranging the material illustrating the resources of the United States as derived from the animal kingdom. It is also intended to indicate the general character of the articles which are to be included in this branch of the exhibition, and forms the table of contents to a more detailed classification which will soon be published.

Contributions of specimens of the different classes enumerated are much desired, for the purpose of making the proposed display complete, and should be addressed to the Smithsonian Institution, Washington, D. C.

JOSEPH HENRY,
Secretary Smithsonian Institution.

CONTENTS.

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C.—Means of Utilization - - - - - - - - - - - - - - 7
D.—Animal Products and their Applications - - - - - - - 8
E.—Protection and Culture of Useful Animals - - - - - - - 10

SECTION A.—ENUMERATION OF ANIMALS BENEFICIAL OR INJURIOUS TO MAN.

SYNOPSIS.*

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X. Arachneans - - - - - - - 53
XI. Crustaceans - - - - - - -
XII. Worms - - - - - - - - - -
XIII. Mollusks - - - - - - -
XIV. Radiates - - - - - - - -
XV. Protozoans - - - - - - -
XVI. (Marine products not of animal nature.)

I. MAMMALS.

1. Feræ, (Carnivores.)
    - Fissipedia, (Land Carnivores.)
    - Pinnipedia, (Seals, &c.)
2. Ungulata, (Hoofed Animals.)
3. Proboscidea, (Elephants, &c.)
4. Sirenia, (Sea Cows, &c.)
5. Cete, (Whales.)
    - Denticete, (Sperm Whales and Dolphins.)
    - Mysticete, (Baleen Whales.)
6. Chiroptera, (Bats.)
7. Insectivora, (Moles, &c.)
8. Glires, (Gnawers.)
9. Bruta, (Edentates.)
10. Marsupialia, (Marsupiates.)

II. BIRDS.[†]

11. Passeres, (Passerines.)
12. Picariæ, (Woodpeckers.)
13. Cuculi, (Cuckoos.)
14. Psittaci, (Parrots.)
15. Raptores, (Birds of Prey.)
16. Columbæ, (Pigeons.)
17. Gallinæ, (Gallinaceous Birds, in part.)
18. Limicolæ, (Plovers.)
19. Herodiones, (Herons.)

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[*] NOTE.—In this classification no effort is made to express zoological rank in the divisions adopted. Classes XI to XVI, inclusive, are covered by the "*List intended to give a general idea of the useful products (other than vertebrates) of the sea and shore, as well as of the interior waters of the United States,*" prepared by Mr. WM. H. DALL, and printed as Circular No. 2 of series (C.)

[†] The divisions of birds, though not of ordinal rank, are, for the sake of convenience, placed in the same rank with the orders of Mammals, Reptiles, &c.

20. Alectorides, (Cranes.)
21. Lamellirostres, (Flamingoes and Anserine Birds.)
22. Steganopodes, (Cormorants.)
23. Longipennes, (Gulls.)
24. Pygopodes, (Grebes and Auks.)
25. Sphenisci, (Penguins.)

III. REPTILES.

26. Crocodilia, (Crocodiles.)
27. Testudinata, (Tortoises.)
28. Lacertilia, (Lizards.)
29. Ophidia, (Serpents.)

IV. AMPHIBIANS.

30. Anura, (Frogs.)

31. Urodela, (Salamanders.)
32. Proteida, (Menobranchus, &c,)
33. Trachystomata, (Sirens.)

V. FISHES.

34. Pediculati, (Anglers.)
35. Plectognathi, (Globe, Trunk, and File Fishes.)
36. Lophobranchii, (Pipe Fishes, &c.)
37. Hemibranchii, (Sticklebacks, &c.)
38. Teleocephali.
    - Heterosomata, (Flat Fishes.)
    - Anacanthini, (Cods, &c.)
    - Acanthopteri, (Spiny-finned Fishes.)
    - Percesoces, (Mullets, &c.)
    - Synentognathi, (Gar Fishes and Flying Fishes.)
    - Haplomi, (Pikes, &c.)

Isospondyli, (Salmon, Herring, &c.)
Eventognathi, (Carps.)
39. Nematognathi, (Cat Fishes.)
40. Apodes, (Eels.)
41. Cycloganoidei, (Amias.)
42. Rhomboganoidei, (Gar Pikes.)
43. Selachostomi, (Paddle Fish.)
44. Chondrostei, (Sturgeons.)

VI. ELASMOBRANCHIATES.

45. Holocephali, (Chimæras.)
46. Raiæ, (Skates and Rays.)
47. Squali, (Sharks.)

VII. MARSIPOBRANCHIATES.

48. Hyperoartia, (Lampreys)
49. Hyperotreti, (Hags.)

VIII. LEPTOCARDIANS.
  50. Cirrostomi, (Lancelets.)
IX. INSECTS.
  51. Insecta, (Insects.)
  52. Myriapoda, (Centipedes, &c.)
X. ARACHNEANS.
  53. Arachnida, (Spiders.)
XI. CRUSTACEANS.
XII. WORMS.
XIII. MOLLUSKS.
XIV. RADIATES.
XV. PROTOZOANS.
XVI. MARINE PRODUCTS NOT OF ANIMAL NATURE.

SECTION B.—MEANS OF PURSUIT AND CAPTURE.

SYNOPSIS.

† *Apparatus of direct application.*

I. Hand implements - - - - - - - - - - - - - - - - 1–5

II. Implements for seizure of objects - - - - - - - - - - 6–12

III. Missiles - - - - - - - - - - - - - - - - - - 13–26
IV. Baited hooks—Angling tackle - - - - - - - - - - 27–29

††† Apparatus to a greater or less extent automatic.

V. Nets - - - - - - - - - - - - - - - - - - - 30–31

†††† Apparatus entirely automatic.

VI. Traps - - - - - - - - - - - - - - - - - - 32–36
VII. Apparatus for wholesale destruction - - - - - - - - - 37–39

††††† Accessories to the chase and fishing.

VIII. Hunting animals - - - - - - - - - - - - - - 40–44
IX. Decoys and disguises - - - - - - - - - - - - - - 45–47
X. Pursuit—its methods and appliances - - - - - - - - 48–50

I. HAND IMPLEMENTS, (SIMPLE TOOLS.)

* *For striking.*

1. Clubs.
2. Slung weights.

** *For cutting.*

3. Knives.
4. Axes.

*** *For thrusting.*

5. Spears and prods.

II. IMPLEMENTS FOR SEIZURE OF OBJECT.

* *Scooping instruments.*

6. Scoops.

** *Grasping hooks.*

7. Hooked implements, (used with single motion, that of hooking.)
8. Barbed implements, (used with two motions, the first that of thrusting.)
9. Tongs, &c.

*** *Grasping lines.*

10. Nooses, (lariats and snares.)
11. Loaded lines, (bolas.)

**** *Entangling lines.*

12. Tangles.

III. MISSILES.

* *Simple missiles, (those propelled by the unaided arm.)*

13. Hurled weights.
14. Hurled sticks.
15. Hurled spears, lances.

** *Centrifugal missiles, (propelling power augmented by artificial lengthening of the arm.)*

16. Slings; and spears thrown by straps.
17. Missiles thrown by "throwing sticks."

*** *Missiles propelled by a spring.*

‡ Spring consisting of bent rod.

18. Bows and arrows.

‡‡ Spring consisting of elastic cord.

19. India rubber slings.

‡‡‡ Spring consisting of metallic helix.

20. Spring guns.

**** *Missiles propelled by compressed air or water.*

21. Air guns.
22. Water guns.

***** *Missiles propelled by combustion of gunpowder.*

23. Fire arms.
24. (Accessory.) Ammunition and its preparation.
25. (Accessory.) Accessories of loading, repairing, and testing fire arms.
26. (Accessory.) Accessories of carrying fire arms. (Accoutrements.)

IV. BAITED HOOKS—ANGLING TACKLE.

27. Hooks with movable lines.—Hand tackle.
28. Hooks with stationary lines.—Set tackle.
29. (Accessory.) Parts and accessories to angling apparatus.

V. NETS.

30. Entangling (meshing) nets.
31. Encircling nets.

VI. TRAPS.

32. Pen traps.
33. Clutching traps.
34. Fall traps.
35. Missile traps.
36. Adhesive preparations.

VII. APPARATUS FOR WHOLESALE DESTRUCTION.

37. Poisons.
38. Asphyxiating apparatus.
39. Torpedoes.

VIII. HUNTING ANIMALS.

40. Hunting mammals.
41. Accessories to hunting mammals.
42. Hunting birds.

43. Accessories to hunting birds.
44. Hunting fishes.

IX. *DECOYS AND DISGUISES.*

45. Baits.
46. Decoys.
47. Covers.

X. *PURSUIT—ITS METHODS AND APPLIANCES.*

48. Methods of transportation.
49. Camp outfit.
50. Personal equipments.

SECTION C.—MEANS OF UTILIZATION.

SYNOPSIS.

I. Preparation and preservation of foods - - - - - - - - 1–5
II. Manufacture of textile fabrics, felts, and stuffings - - - - - 6–10
III. Preparation of the skin and its appendages - - - - - - - 11–16
IV. Preparation of the hard materials - - - - - - - - - 17–24
V. Preparation of oils and glues - - - - - - - - - - - 25–29
VI. Preparation of drugs, perfumes, and chemical products - - - 30–44
VII. Preparation of fertilizers - - - - - - - - - - - - - 45
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12. Baleen.
13. Tortoise-shell.
14. Scales.
15. Pearl.
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18. Infusorial earth.
19. Other materials derived from invertebrates.

** *Flexible materials.*

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CLASSIFICATION

OF THE

COLLECTION TO ILLUSTRATE

THE

ANIMAL RESOURCES OF THE UNITED STATES.

A LIST OF SUBSTANCES DERIVED FROM THE ANIMAL KINGDOM, WITH
SYNOPSIS OF THE USEFUL AND INJURIOUS ANIMALS
AND A CLASSIFICATION OF THE METHODS
OF CAPTURE AND UTILIZATION.

By G. BROWN GOODE, M. A.,
ASSISTANT CURATOR U. S. NATIONAL MUSEUM.

WASHINGTON:
GOVERNMENT PRINTING OFFICE.
1876.

ADVERTISEMENT.

This work is the sixth of a series of papers intended to illustrate the collections of Natural History and Ethnology belonging to the United States and constituting the National Museum, of which the Smithsonian Institution was placed in charge by the act of Congress of August 10, 1846.

It has been prepared at the request of the Institution, and printed by authority of the honorable Secretary of the Interior.

JOSEPH HENRY,
Secretary Smithsonian Institution.

SMITHSONIAN INSTITUTION,
Washington, February, 1876.

PREFACE.

The following classification has been prepared by Mr. Goode to facilitate the work of collecting and arranging the material gathered by the National Museum to illustrate the resources of the United States as derived from the animal kingdom, in the International Exhibition of 1876. It is also intended to indicate the general character of the articles which are to be included in this branch of the exhibition.

Contributions of specimens of the different classes enumerated are much desired, for the purpose of making the proposed display complete, and should be addressed to the Smithsonian Institution, Washington, D. C.

JOSEPH HENRY,
Secretary Smithsonian Institution.

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INTRODUCTION.

The system proposed in the following lists has been hurriedly prepared, and is necessarily very incomplete; it is intended merely as a provisional classification, to be used in collecting the materials for the exhibition, and in their preliminary arrangement.

The first group, SECTION A, is an index to the whole series; it will include all North American animals which are directly beneficial or injurious to man. Although every species, down to the very least, exercises some influence upon human well-being, it seems scarcely practicable to attempt the exhibition of those which affect it only indirectly. Those species are considered useful which supply food, clothing, shelter, implements, materials, and amusement; those injurious which endanger the life or personal comfort of man, or destroy those animals and plants which are of direct benefit to him. In the enumeration of animals, the names of the orders are given, followed in parenthesis by the best-known names of the more important species included, and a brief note on their principal uses. This enumeration, being simply of convenience, makes no claim to zoological precision.

SECTION B embraces all instruments and methods employed by the hunters, trappers, and fishermen of North America, aboriginal and civilized. Not only those which are directly employed in destruction or capture are included, but the means made use of in pursuing or attracting the animals and fishes, and the personal equipment of the pursuer. The collection will be a monograph of *all* matters relating to the chase and the fisheries of the country. In preparing the classification here submitted, the principles of zoological classification have been followed as closely as possible; each distinct form has been considered a species; and the specific forms have been grouped into genera, families, and orders according to the general balance of their affinities. Form and manner of use have not been without weight, but superficial resemblance has been set aside, and the *idea* given the first importance. Thus, barbed spears and harpoons have been placed with the "hooked instruments," while plain spears and lances are grouped with the knives and clubs. In studying the place of the fire-arms and bows and arrows, the missile itself has been regarded as more important than the machine which propels it, and the latter is placed in a subordinate relation.

In one group, that of nets, convenience in arrangement of the specimens seems to demand that *material*, a character of small importance, shall be made prominent. Two widely diverging groups of apparatus are associated under the head of nets, viz, encircling-nets, the true relations of which are with grasping and scooping instruments, and entangling nets which belong with the traps, where a third group of nets, the pound and weir nets are actually classed. Where the exigencies of administration of the specimens demand that they should be arranged otherwise than in their exact systematic position, full cross-references are given.

The simplest implements have always been placed first, the series advancing in the order of complication of structure. Thus we have in the beginning the apparatus of direct application, or tools, including, first, those implements which are used in the hand, and which increase its power in a simple way, such as clubs and slung-shot, which merely add to the weight of the fist, followed by the knives, axes, and spears, which in their simplest and primitive form were sharpened stones and pointed sticks. Second, are the grasping-implements, or those by which the power of the fingers is extended. In this series the same principle of progress from simple to complex is followed; in the scoop we have the idea of the hollow palm of the hand developed in various forms, while the grasping-hooks and grasping-lines are the artificial extensions of the human finger. Under hooked instruments, the simple hooks, or those which are attached to the object by a single motion, a pulling one, are placed first, followed by the barbed implements, in which the attachment is made by a thrusting, succeeded by a pulling motion, and then by the tongs and forceps, which are essentially double hooks. The succeeding division is that containing the lasso and bolas, which are worked at long distances and require great skill, succeeded by the tangles, which are, in principle, assemblages of lassos, entangling objects among their fiber nooses.

In the third division, that of missiles, the same principle of succession is adhered to. First are placed those missiles which are propelled by the unaided arm; then those in using which the arm is artificially lengthened, as with the sling, string, or darting stick; then those in which the propelling power is derived from the elasticity of rods and cords, the strength of the arm having become subsidiary; closing with those in the use of which the strength of the arm is of no essential value, and the propelling power originates in chemical combustion.

Accessory to these are groups containing those articles used in the manufacture, testing, loading, and transportation of these missiles, and the machines which drive them through the air.

In a fourth division is the apparatus of angling, which is separated from hooked implements with which the form of the articles would naturally place them, since they are not implements of grasping, but partake of the nature of traps, being in part automatic.

The group of nets is a heterogeneous one, as has been stated above, consisting of two divisions, the first that of entangling-nets, belonging properly with traps, while encircling-nets are in idea instruments for grasping.

In arranging traps a logical succession has been preserved as far as possible. Those traps are considered the most simple in which the animal is penned by its own act, without any change in the arrangement of the trap. The pit-falls or "tipes" are first, followed by the mazes or labyrinths of greater or less complexity. Then come the traps in which the entrance is closed, either by the falling of a door or by the falling of a box-like trap, as a whole, so as to surround the animal. Under clutching-traps are placed those which seize the animal, as in the fingers, while crushing-traps are those which seize or impale it bodily. Adhesive preparations, such as bird-lime, close the series.

The accessory divisions, including hunting-animals, decoys, and disguises, and the methods and appliances of pursuit, do not admit any thorough classification, and are arranged with reference to convenience of exhibition.

SECTION C includes all methods of utilizing animals' products. It might be more satisfactorily arranged with the following section, were it not for the inconvenience of exhibiting models and tools in the same cases with the manufactured products; the arrangement of the two sections is nearly the same.

In SECTION D are grouped all useful substances derived from the animal kingdom. In order to avoid the omission of any products which are or may be obtained from North American animals, this enumeration has been made general, those not American being included in parentheses. This enumeration is far from complete, and is intended simply as an aid to future study in the same direction.

SECTION E includes all articles illustrating the culture and protection of useful animals.

SECTION A.

ENUMERATION

OF

ANIMALS BENEFICIAL OR INJURIOUS TO MAN,

(WITH A SYNOPSIS OF THEIR USEFUL APPLICATIONS.)

I. MAMMALS.

1. FERAE:

FISSIPEDIA. (Cats, pumas, jaguars, ocelots, lynxes, wolves and dogs, foxes, fishers, martens, minks, weasels, wolverenes, badgers, skunks, otters, sea-otters, bears, raccoons, and the domesticated cat, dog, and ferret.)

Useful products:

- Food, (bears, raccoon, &c.) D. 1.
- Fur, (all the group.) D. 6.
- Leather, (dog, cat.) D. 20.
- Textile fabrics, felt, (raccoon.) D. 8.
- Ivory, teeth, (bear, fox, &c.) D. 9.
- Claws used by Indians, (bears, puma.) D. 11.
- Hair, for brushes, (badger, dog, weasel, skunk, bear.) D. 21.
- Oil, (bears.) D. 27.
- Perfumes, (civet, &c.) D. 28.
- Medicinal products, (skunk.) D. 30.
- Chemical agent, *album græcum*, (dog.) D. 30.

Useful traits:

- Susceptible of domestication, (wolves (Indian dog,) foxes, otters, bears, raccoon, dog, cat, ferret.)
- Employed in hunting, (dog, cat, ferret.) B. 40.
- Employed in fishing, (otter.) B. 40.

1. FERAE—Continued.
  FISSIPEDIA—Continued.
    Injurious traits:
      Enemies of man, (cats, wolves, bears.)
      Enemies of domestic animals.
      Marauders on crops, (bears, raccoon.)
      Stench nuisances, (skunks.)
      Modes of capture. B. I, II, III, VI, X.
  PINNIPEDIA. (Fur-seals, sea-lions, hair-seals, hood-seals, sea-elephants, walruses.)
    Useful products:
      Food of aborigines. D. 1.
      Fur, (fur-seals, &c.) D. 6.
      Leather, &c., parchment from viscera, (sea-lions, hair-seals, walruses.) D. 20.
      Oil, (hair-seal, hood-seal, sea-elephant, &c.) D. 27.
      Ivory, (walrus.) D. 9.
    Injurious traits: Destroy fish.
    Modes of capture. B. I, III, V, X.
2. UNGULATA. (Bison, musk-ox, mountain-goat, mountain-sheep, antelope, moose, caribou, elk, deer, peccary, and the domesticated ox, goat, sheep, hog, horse, ass, and camel.)
    Useful products:
      Food, fresh, smoked, and pickled, (all the group.) D. 1, 2, 3.
      Fur, (bison, musk-ox, goat, sheep, moose, &c.) D. 6.
      Leather, (all the group.) D. 20.
      Textile fabrics and felt, (ox, goat, sheep, camel, musk-ox.) D. 8.
      Ivory and bone. D. 9.
      Horn, (bison, ox, goat, sheep, deer, elk, &c.) D. 10.
      Hoof, (bison, musk-ox, goat, sheep, deer, horse, &c.) D. 11.
      Hair, bristles, and wool, (bison, ox, goat, sheep, deer, hog, camel.) D. 21.
      Gelatine and glue. D. 4, 24.
      Oil and fat. D. 27.
      Perfumes, (musk-ox, musk-deer.) D. 28.
      Coloring materials from blood and bile. D. 29.

2. UNGULATA—Continued.
    - Useful products:
        - Chemical products. D. 30.
        - Fertilizers. D. 31.
    - Useful traits: Susceptible of domestication.
    - Modes of capture. B. I, II, III, VI, IX.

3. PROBOSCIDEA. (Elephants.*)
    - Useful products: Ivory. D. 9.

4. SIRENIA. (Manatee, or sea-cow.)
    - Useful products:
        - Food. D. 1.
        - Leather. D. 7, 20.
        - Oil. D. 27.

5. CETE. (Whales.)
    - DENTICETE. (Beluga, narwhal, porpoise, black-fish, killer, grampus, sperm-whale.)
    - Useful products:
        - Food, Indian, (sperm-whale, porpoise.) D. 1.
        - Oils, (all the group.) D. 27.
        - Spermaceti, (sperm-whale,)
        - Leather, (porpoise, beluga.) D. 7, 20.
        - Bone and ivory, (narwhal, sperm-whale.) D. 9.
        - Perfume, *ambergris*, (sperm-whale.)
    - Injurious traits: Destroy fish and seals.
    - Modes of capture. B. I, II, III, X.
    - MYSTICETE. (Right, or whale-bone whales.)
    - Useful products:
        - Food, (right-whale.) D. 1.
        - Baleen. D. 12.
        - Oil, (right-whale, &c.) D. 27.

6. CHIROPTERA. (Bats.)
    - Useful products:
        - Food, Indians. D. 1.
        - Felting material. D. 8.
        - Guano. D. 31.
    - Useful traits: Destroy troublesome insects.
    - Injurious traits: Disseminate troublesome insects.

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* *Elephas primigenius*, found fossil in North America.

7. INSECTIVORA. (Moles and shrews.)
   - Useful products:
     - Fur, (moles.) D. 6.
     - Felting material, (moles.) D. 8.
   - Useful traits:
     - Destroy burrowing insects, &c.
   - Injurious traits: Burrowers.
   - Modes of capture. B. VI.
8. GLIRES. (Squirrels, prairie-dogs, showtl, marmots, musquash, beaver, rats, mice, lemmings, porcupines, rabbits, and the domesticated rabbit, and Guinea-pig.)
   - Useful products:
     - Food. D. 1.
     - Fur, (squirrels, showtl, marmots, musquash, beaver, lemmings, rabbit, &c.) D. 6.
     - Textile fabric, felt, (musquash, beaver, rabbit.) D. 8.
     - Ivory, (beaver.) D. 9.
     - Leather, (rat, beaver.) D. 7, 20.
     - Hair and down, (rabbits.) D. 21.
     - Quills, (porcupine.) D. 21.
     - Perfume, *castoreum*, (beaver.) D. 28.
   - Useful traits: Susceptible of domestication, (squirrels, rabbits, &c.)
   - Injurious traits: Marauders.
   - Modes of capture. B. I, II, III, VI, VII, VIII, IX.
9. BRUTA. (Armadillo, &c.)
   - Useful products: Shell used by Indians in various manufactures. D. 14.
   - Injurious traits:
     - Burrower.
     - Marauder.
10. MARSUPIALIA. (Opossum.)
    - Useful products:
      - Food. D. 1.
      - Hair used in felting. D. 8.
    - Injurious traits: Marauder.
    - Modes of capture. B. I, II, III, VI, VIII

II. BIRDS.

11. PASSERES. (Thrushes, stone-chats and blue-birds, dippers, kinglets, titmice, nuthatches, creepers, wrens, larks, wagtails, warblers, tanagers, swallows, waxwings, greenlets, shrikes, finches, starlings, black-birds and orioles, crows and jays, fly-catchers, and domesticated sparrow, canary, &c.)

Useful products:

Foods, (thrushes, rice-birds, &c.) D. 1.

Ornamental feathers. D. 23.

Useful traits:

Destroy insects.

Song-birds, (generally susceptible of domestication.)

12–13. PICARIÆ AND CUCULI. (Night-hawks, whippoorwills, swifts, humming-birds, trogons, saw-bills, kingfishers, cuckoos, woodpeckers.)

Useful products: Ornamental feathers, (humming-birds, trogons.) D. 23.

Useful traits:

Destroy noxious insects, (night-hawks, swifts.)

Destroy tree-borers, (woodpeckers.)

Injurious traits:

Destroy fish, (kingfishers.)

Destroy birds'-eggs, (cuckoos.)

Destroy fruit, (woodpeckers.)

Destroy trees, (sap-sucker.)

14. PSITTACI. (Parroquet and domesticated parrots.)

Useful products: Ornamental feathers. D. 23.

Useful traits: Susceptible of domestication.

15. RAPTORES. (Owls, hawks, eagles, vultures, buzzards.)

Useful products:

Ornamental feathers. D. 23.

Quills. D. 22.

Useful traits:

Susceptible of domestication and use in hunting.[1]

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[1] Nine species of falcons, hawks, and owls have been employed in the chase by Europeans.

15. RAPTORES—Continued.

Useful traits:

Scavengers, (vultures, buzzards.)

Destroy vermin, (owls, hawks.)

Injurious traits: Destroy domestic animals, eggs, &c.

16. COLUMBÆ. (Pigeons and doves.)

Useful products:

Food.

Ornamental feathers. D. 23.

Useful traits:

Game-birds.

Susceptible of domestication.

Used as targets, (wild pigeon.) B. 25.

Used as carriers, (carrier-pigeon.)

17. GALLINÆ. (Turkey, grouse, partridge, sage-cock, ptarmigan quail, and the domesticated peacock, guinea-fowl, and fowl.)

Useful products:

Foods, flesh. D. 1.

Ornamental feathers. D. 23.

Quills. D. 22.

Albumen. D. 30.

Useful traits:

Game-birds.

Susceptible of domestication.

18. LIMICOLÆ. (Plover, ring-neck, surf-bird, oyster-catcher, turnstone avoset, stilt, phalarope, woodcock, snipe, sandpiper dunlin, godwit, sanderling, willet, tattler, yellow shanks, green-shanks, curlew.)

Useful products:

Food: Flesh. D. 1.

Eggs. D. 1.

Feathers. D. 23.

Useful traits: Game-birds.

19. HERODIONES. (Ibises, spoonbills, herons, egrets, bitterns.)

Useful products: Ornamental feathers. D. 23.

Useful traits: Destroy vermin.

20. ALECTORIDES. (Cranes, rails, crakes, gallinules, coots.)
    Useful products:
        Food, (rails, crakes.) D. 1.
        Feathers. D. 23.
        Useful traits: Susceptible of domestication, (cranes.)
21. LAMELLIROSTRES. (Flamingoes, swans, geese, ducks.)
    Useful products:
        Food: Flesh, (geese, ducks.) D. 1.
            Eggs, (geese, ducks.)
        Ornamental feathers, (flamingo, geese, &c.) D. 23.
        Down, (geese, ducks.) D. 23.
    Useful traits:
        Susceptible of domestication, (geese, ducks.)
        Used as decoys for other swimmers, (brants, ducks.)
22. STEGANOPODES. (Gannets, pelicans, cormorants, darters or water-turkeys, frigate birds, tropic birds.)
    Useful products:
        Ornamental feathers, (darters, tropic birds.) D. 23.
        Leather, (of feet.) D. 20.
    Useful traits: Susceptible of domestication.[1]
23. LONGIPENNES. (Gulls, terns, skimmers, petrels, albatrosses shearwaters.)
    Useful products:
        Food, eggs. D. 1.
        Ornamental feathers, (gulls, terns, &c.) D. 23.
        Oil, (petrels, &c., used by Eskimos.) D. 27.
24. PYGOPODES. (Loons, grebes, auks, puffins, guillemot, murres.)
    Useful products:
        Foods, (eggs.) D. 1.
        Ornamental feathers, (grebes.) D. 23.
        Feathers used as furs, (grebes, auks, &c.) D. 8.
25. SPHENISCI. (Penguins.)
    Useful products:
        Feathers used as fur. D. 6.
        Oil. D. 27.

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[1] *Graculus carbo* used in Europe for fishing and a similar species in China.

III. REPTILES.

26. CROCODILIA. (Alligator, crocodile.)
  Useful products:
    Food. D. 1.
    Ivory. D. 8.
    Leather. D. 20.
    Oil. D. 27.
    Musk. D. 28.
  Injurious traits:
    Enemies of man and domestic animals.

27. TESTUDINATA. (Tortoises, terrapin, leather-back, green, loggerhead, and hawks-bill turtles.)
  Useful products:
    Food: Flesh, (green turtle, terrapin, gopher tortoise.) D. 1.
      Eggs, (green turtle, terrapin, gopher tortoise.)
    Oil from eggs, (green turtle.) D. 27.
    Shell, (turtles.) D. 13.
    Perfume. D. 28.
  Methods of capture and transportation. E. 3.

28. LACERTILIA. (Lizards, skinks, horned-toads, chameleons, scorpions, joint-snakes, &c.)
  Useful products: Food of Indians. D. 1.
  Medicinal product: (Skink.) D. 30.
  Useful traits: Destroy noxious insects.

29. OPHIDIA. (Snakes.)
  Useful products:
    Leather, (rattlesnakes, bull snakes.) D. 27.
    Medicinal products, (rattlesnakes, copperheads.) D. 30.
    Oil, (rattlesnakes.) D. 27.
  Useful traits: Destroy vermin.
  Injurious traits: Enemies of man, (rattlesnakes, copperheads, and moccasins.)

IV. AMPHIBIANS.

30. ANURA. (Frogs, toads, hyla, &c.)
  Useful products:
    Food, (frogs.) D. 1.
    Material for physiological instruction, (frogs.)

30. ANURA—Continued.
  Useful products:
    Weather indicators, (hyla.)
  Useful traits: Destroy noxious insects, (toads.)
31. URODELA. (Salamanders, axolotls, and menopomes.)
  Useful products: Foods, aboriginal, (axolotls.)
  Useful traits: Aquarium use.
  Injurious traits: Enemies of young fish.
32. PROTEIDA. (River-dogs, hell-benders.)
  Injurious traits: Enemies of young fish.
33. TRACHYSTOMATA. (Sirens.)

V. FISHES.

34. PEDICULATI. (Sea-bats or devil-fish, goose-fish or angler, mouse-fish, &c.)
  Useful products: Baits, (goose-fish.) D 1.
  Injurious traits: Enemies of aquatic birds, (goose-fish.)
35. PLECTOGNATHI. (Sun-fish, rabbit-fish, porcupine-fish, swell-fish, box-fish, trunk-fish, cow-fish, file-fish, trigger-fish.)
  Useful products:
    Food, (file-fish, trunk-fish.) D. 11.
    Clothing, (helmets made from porcupine-fish.) D. 20.
    Oils, used in medicine, (sun-fish.) D. 27.
    Shagreen, (file-fish, trigger-fish.) D. 30.
36. LOPHOBRANCHII. (Sea-horse, pipe-fish.)
  Useful traits: Aquarium use.
37. HEMIBRANCHII. (Snipe-fish, trumpet-fish, stickleback.)
  Useful traits: Aquarium use, (sticklebacks.)
  Injurious traits: Destroy eggs of other fishes.
38. TELEOCEPHALI:
  HETEROSOMATA, (soles, flounders, flatfish, turbot, halibut.)
  Useful products:
    Foods: Fresh. D. 1.
      Smoked, (halibut.) D. 2.
      Pickled, (halibut.) D. 3.
    Baits, D. 5.

38. TELEOCEPHALI—Continued.

ANACANTHINI, (cod, pollock, haddock, hake, ling, cusk, burbot, rockling, lance.)

Useful products:

Food: Fresh. D. 1.

Salted, wet, (cod,) (cods' sounds, tongues.) D. 3.

Salted, dry, (cod, haddock, hake.) D. 2.

Bait, (lance.) D. 5.

Isinglass, (cod, haddock, hake.) D. 24.

Leather, (N. W. coast Indians, cod.) D. 27.

Oil, (cod, haddock, hake, livers.) D. 30.

ACANTHOPTERI, (Wolf-fish, blenny, oyster-fish, toad-fish, lump-fish, sea-snail, goby, sea-robin, gurnard, sculpin, sea-raven, Norway haddock or hemdurgan, red-fish, rock cod (west coast), black-fish, or tautog, cunner or chogset, parrot-fish, vurparous-fish (west coast), surgeon-fish, angel-fish, chætodons, sword-fish, bayonet-fish, scabbard-fish, mackerel, cero, tunny, bonito, crevallé, pompano, pilot-fish, dolphin, butter-fish, weak-fish, drum, croaker, king-fish, whiting, bass, sheepshead, scup or porgy, grunts or pig-fish, black bass, sunfish, strawberry bass, rock bass, perch, groupers, striped bass or rock-fish, blue-fish, tailor, cobia, remora, barracuda.)

Useful products:

Food: Fresh. D. 1.

Salted, wet, (sword-fish, mackerel, tunnies, pompanoes, blue-fish.) D. 2.

Baits. D. 5.

Isinglass, (weak-fish, drum, &c.) D. 24.

Ornament, scales, (parrot-fish, drum.) D. 14.

Injurious traits:

Poisonous, (barracuda, dolphin, &c.)

Enemies of vessels, (sword-fish, bayonet-fish.)

Parasitic on useful fishes, (remora, toad-fish, and sea-snail, (on oysters and pectens,) &c.)

Bait-thieves, (sculpins.)

38. TELECOPHALI—Continued.

PERCESOCES. (Atherines, mullet.)

Useful products:

Food: Fresh. D. 1.

Salted, smoked, (mullet, mullet-spawn.) D. 2.

Salted, wet, (mullet.) D. 3.

Bait, (atherines.) D. 5.

Scales, (mullet.) D. 14.

SYNENTOGNATHI. (Gar-fish, flying-fish.)

Useful products:

Food: Fresh. D. 1.

Salted, smoked, (gar-fish, flying-fish.) 1.

HAPLOMI. (Blind-fish, pike, pickerel, minnows.)

Useful products:

Food, (pike, pickerel.) D. 1.

Bait, (minnows.) D. 5.

Injurious traits:

Enemies of other fishes and of aquatic birds, (pikes, pickerels.)

ISOSPONDYLI. (Capelin, oulachan, smelt, white-fish, salmon, trout, tarpum, herring, menhaden, shad, alewife or gaspereau, anchovy, &c.)

Useful products:

Food: Fresh. D. 1

Salted, (shad, salmon, white-fish, herring, &c.) D. 2.

Smoked, (herring, salmon, &c.) D. 1.

Canned, (salmon, menhaden, sardines, &c.) D. 1.

Eggs. D. 1.

Sauce, (anchovy.) D. 3.

Oil, (salmon, oulachan, white-fish, menhaden, herring.) D. 27.

Bait, (capelin.) D. 5.

Ornamental scales, (tarpum.) D. 14.

Guano, (menhaden, herring, &c.) D. 31.

Modes of culture. E. 9.

EVENTOGNATHI. (Suckers, dace, buffalo-fish, carp, tench, &c.)

Useful products:

Food. D. 1.

Bait. D. 5.

Artificial pearls. D. 29.

Modes of culture, (including domesticated species.) E. 9.

39. NEMATOGNATHI. (Cat-fish, "bull-heads," &c.)
    - Useful products:
        - Food. D. 1.
        - Guano, (cat-fish.) D. 31.
40. APODES. (Eels, congers.)
    - Useful products:
        - Food. D. 1.
        - Bait, eel-skins. D. 5.
        - Leather, (eels.) D. 20.
41. CYCLOGANOIDEI. (Mud-fish, or amia.)
42. RHOMBOGANOIDEI. (Gar-pikes.)
    - Useful products: Scales, used for arrow-tips. D. 14.
    - Injurious traits: Enemies of other fish.
43. SELACHOSTOMI. (Paddle-fish, or spoon-bill)
44. CHONDROSTEI. (Sturgeons.)
    - Useful products:
        - Foods: Fresh. D. 1.
            - Smoked. D. 1.
            - Eggs, pickled, (caviare.) D. 3.
            - Chorda-dorsalis, dried, (veziga.) D. 2.
            - Isinglass, (sturgeon.) D. 24.
        - Oil. D. 27, T.
        - Scales. D. 14.
    - Useful traits: Scavengers.
    - Injurious traits: Said to destroy eggs of white-fish.

VI. ELASMOBRANCHIATES.

45. HOLOCEPHALI. (Chimæra, or king of the herrings.)
46. RAIÆ. (Skates, rays, "devil-fish.")
47. SQUALI. (Sharks.)
    - Useful products:
        - Food, (sharks, skates.) D. 1.
        - Bone, (sharks.) D. 9.
        - Oil, livers, (sharks, rays, &c.) D. 27.
        - Shagreen, (sharks.) D. 20.
    - Injurious traits: Enemies of man and fishes.

VII. MARSIPOBRANCHIATES.

48. HYPEROARTIA. (Lamprey-eels, or nine eyes.)
49. HYPEROTRETI. (Suckers, or hags.)
    Useful products: Food, (lamprey-eels.) D. 1.
    Useful traits: Scavengers, (hags.)

VIII. LEPTOCARDIANS.

50. CIRROSTOMI. (Amphioxus.)
    Modes of capture. D. 6.

IX. INSECTS.

51. HEXAPODA. (Bees, butterflies and moths, flies, beetles, bugs and lice, grasshoppers and crickets, dragon-flies and caddice flies.)
    Useful products:
        Food of aborigines.
        Honey, (bees, &c.) D. 1.
        Wax, (bees, &c.) D. 30.
        Baits, (flies, bees, dragon-flies, beetles and their larvæ, grasshoppers, &c.) D. 5, B. 45.
        Silk, (moths.) D. 8.
        Coloring material, (cochineal insect, &c.) D. 29.
        Blistering preparations, (Spanish-flies, &c.) D. 30.
        Wings used in the arts, (beetles.) D. 19.
    Useful traits:
        Puncture trees, producing galls, manna, lac, &c.
    Injurious traits:
        Injurious to vegetation, (numerous species.)
        Internal and external parasites, (flies.)
52. MYRIAPODA. (Centipedes, millipedes.)
    Useful products: Food of aborigines, (eggs.) D. 1.
    Injurious traits: Venomous, (centipedes, millipedes.)

X. ARACHNEANS.

53. ARACHNIDA. (Spiders, scorpions, mites, &c.)
    Useful products:
        Fine threads used by opticians, (spiders.)
        Silk, (spiders.)

53. ARACHNIDA—Continued.
    Useful traits: Destroy noxious insects, (spiders.)
    Injurious traits:
        Venomous, (scorpions.)
        Parasites, (mites.)

XI. ARTHROPODS.

54. CRUSTACEA. (Crabs, lobsters, shrimps, prawns, crawfish, limnoria, fish-lice, lernæans, sand and water fleas, barnacles, horseshoe crabs, &c.)
    Useful products:
        Foods, (fresh and canned crabs, lobsters, shrimps, prawns, crawfish, lobsters.)
        Baits, (crabs, lobsters, shrimps, prawns, &c.)
        Manures, (horseshoe crabs.)
    Useful traits: Skeleton cleaners, (beach fleas, &c.)
    Injurious traits:
        Parasites on fishes and marine mammals, (barnacles, fish-lice, &c.)
        Destroy earthworks, dams, &c., (crawfish.)
        Destroy submerged timbers, (limnoria, &c.)
    Modes of protection against injurious species. E. 4.
    Methods of capture. D. 7, 31, 32.

XII. WORMS.

55. ANNELIDA. (Sipunculoids, leeches, earth-worms, serpulæ, sea-worms, &c.)
    Useful products:
        Food of aborigines, (earth-worms.) D. 1, 2.
        Baits, (earth-worms, sea-worms.) D. 5.
    Useful traits:
        Used in surgery, (leeches.)
        Used as barometers, (leeches.)
    Injurious traits: External parasites of animals, (leeches.)
    Methods of culture, (leeches.) E. 11.

56. SCOLECIDA. (Tape-worms and flukes, planarians, nemerteans, trichinæ, thread-worms, rotifers, &c.)
    Injurious traits: Internal parasites, (numerous species.)

XIII. MOLLUSKS.

57. CEPHALOPODA. (Octopus, nautilus, argonauts, calamaries or squids.)

Useful products:

Food, (squids and their eggs.) D. 1.

Bait, fresh and salted, (octopus, squids.) D. 1, 5.

Ink, sepia, (sepias.) D. 29.

"Bone," used as food for animals. D. 5.

"Bone," used in arts and manufactures. D. 19.

58. GASTROPODA. (Land-snails, sea-snails, whelks, limpets, &c.)

Useful products:

Food, (numerous species.) D. 1, 2.

Bait, (limpets, &c.) D. 5.

Nacre, (top-shells, ear-shells, &c.) D. 15.

Shell used in arts and manufactures. D. 16.

Useful traits:

Carrion-feeders, (strombus and other siphonated genera.)

Food of useful animals.

Injurious traits:

Predatory on other mollusks, (murex, buccinum, natica, &c.)

Injurious to vegetation.

59. CONCHIFERA. (Ordinary bivalve shells.[1])

Useful products:

Food, fresh, dried, and pickled, (numerous species.) D. 1, 2, 3.

Baits, (clams, mussels, &c.) D. 5.

Pearls and nacre, (river-mussels, pearl-oysters, &c.) D. 15.

Shell used in arts and manufactures. D. 16.

Injurious traits: Borers in wood and stone, (ship-worms, pholas, gastrochæna, date, shells, saxicava, ungulina, &c.)

XIV. RADIATES.

60. ECHINODERMATA. (Sea-cucumber, sea-urchins, star-fishes, ophiurans.)

Useful products:

Food, fresh, (sea-urchins and their eggs.) D. 1.

Food, dried, (bêches le mer.)

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[1] *Tunicata*, *brachiopoda*, and *bryzoa* are omitted, on account of their very remote usefulness.

60. ECHINODERMATA—Continued.
- Injurious traits:
  - Burrowers, (various echinoids.)
  - Destroyers of useful mollusks.

61. CŒLENTERATA. (Acalephs, polyps, &c.)
- Useful products: Coral, various species of polyps.) D. 17.
- Injurious traits: Clog seines, weirs, and fishing-lines, (acalephs.)

XV. PROTOZOANS.

62. RHIZOPODA. (Sponges and foraminifera.)
- Useful products:
  - Food, "mountain meal," (foraminifera.) D. 1
  - Infusorial earths, (foraminifera.) D. 18.
  - Sponges, used in arts and manufactures. D. 26.

SECTION B.

(THE CHASE AND THE FISHERIES.)

MEANS OF PURSUIT AND CAPTURE.

I. HAND IMPLEMENTS OR TOOLS.

* *For striking.*

1. CLUBS:
    - *a.* Unarmed clubs:
        - Salmon-clubs, used by the Indians of the Northwest coast.
        - Other fishing-clubs.
        - Hunting-clubs.
    - *b.* Armed clubs:
        - Stone-headed clubs.
        - Clubs, armed with teeth or bone points.
        - Clubs, armed with metal points.
2. SLUNG-WEIGHTS:
    - *a.* Slung-stones.
    - *b.* Slung-shot.
    - *c.* ("Morning stars.")
    - *d.* ("Flails.")

** *For cutting.*

3. KNIVES:
    - *a.* Straight knives:
        - Hunting-dirks and daggers.
        - Hunting-knives, scalp-knives, &c.
        - Blubber-knives, aboriginal and recent.
        - Boarding-knives used by whalemen.
        - Whaleman's boat-knives.
        - Bowie-knives.
        - Flaying-knives, aboriginal and recent.
        - Splitting-knives.
        - Heading-knives.
        - Sailors' and fishermen's sheath-knives.
        - Hunters' sheath-knives.
        - Slivering-knives, used by fishermen.
        - Oyster-knives.

3. KNIVES—Continued.
    - *a.* Straight knives:
        - Mackerel rimmers or fatting knives.
        - (Swords, including the various forms incidentally used in hunting; sabers, cutlasses, machétes, creases, &c.)
        - Stone and bone knives, used by Indians and Eskimos.
        - Skin scrapers and parers, used in preparing leather.
    - *b.* Clasp-knives:
        - Sailors' clasp-knives.
        - Hunters' clasp-knives.
        - Clasp-dirks.
        - Jockey knives.

4. AXES:
    - *a.* Axes, proper:
        - Tomahawks.
        - Hatchets.
        - Whaleman's boat-hatchets.
        - Cleavers.
        - Axes, used by fishermen and hunters.
        - Head-axes for whalemen.
    - *b.* Cutting-spades:
        - Whale-spades:
            - Cutting-spades.
            - Throat-spades, flat and round shank.
            - Wide spades.
            - Half-round spades.
            - Head-spades.
        - Blubber-mincing knives.
        - Chopping-knives.

*** *For thrusting.*

5. THRUSTING SPEARS AND PRODS:
    - *a.* Fishing-lances.
        - Whale-lances.
        - Whaleman's boat-spades, thick and thin.
        - Seal-lances.
        - Fish-lances.
    - *b.* Hunting-spears.
    - *c.* Bayonets.
    - *d.* Prodding-awls, used in piercing the base of the brain in killing fish for the table.

II. IMPLEMENTS FOR SEIZURE OF OBJECT.

** Scooping-instruments.*

6. SCOOPS.

† For hand-use.

- *a.* Shovels:
  - Clam-shovels.
  - Trowels used in taking burrowing shore animals.
  - Hand-scoops.
- *b.* Hand-dredges, used in collecting mollusks.
- *c.* Pile-scrapers.

†† For use with sounding-lines.

- *d.* Armed leads:
  - Common "deep-sea lead."
  - Deep-sea-sounding apparatus.
- *e.* Cup-leads.
- *f.* Scoop sounding-machines.

*** Grasping-hooks.*

7. HOOKED INSTRUMENTS. (Those used with a single motion, that of hooking:)

- *a.* Single-pointed hooks:
  - Gaff-hooks.
  - Boat-hooks.
  - Jigs.
  - Rabbit and squirrel hooks, used by the Ute Indians.
  - Snake-hooks.
  - Clam-hooks.
  - Hoes and picks used in gathering shell-fish.
  - Forks used in handling salted and dried fish.
  - Whalemen's hooks:
    - Blubber-hooks.
    - Blubber-forks.
    - Junk-hooks.
    - Lance-hooks.
    - Can-hooks.

7. HOOKED INSTRUMENTS—Continued.
   - *b.* Many-pointed hooks:
     - Grappling-irons.
     - Lip hooks or grapnels, used by whalers.
     - Toggles, used by whalers.
     - Oyster-rakes.
     - Clam-rakes.
     - Oulachan rakes or spears.
     - Squid-jigs.
   - *c.* Twisting-rods, used in drawing small mammals from their burrows.

8. BARBED IMPLEMENTS. (Those used with two motions, the first that of thrusting:)
   - *a.* Spears with fixed heads:
     - Harpoons.
     - One-flued harpoons.
     - Two-flued harpoons.
     - Toggle-harpoons.
     - Harpoon-bullets. (See under 23.)
     - Gun-harpoons.
     - Other whaleman's "craft."
     - Barbed spears, (with single point.)
     - Grains, (with two prongs.)
     - Gigs.
     - Bird-spears.
     - Otter-spears.
     - Sea-otter spears.
     - Seal-spears.
     - Walrus-spears.
     - Eel-spears.
     - Flounder-spears.
     - Sturgeon-spears, (west coast.)
     - Octopus-spears.
     - Crab-spears, used in Rhode Island.
   - *b.* Spears with detachable heads:
     - Lily-irons.
     - Dolphin-irons.
     - Indian harpoons of shell and iron.
     - Eskimo harpoons of stone, bone, and iron.

8. BARBED INSTRUMENTS—Continued.
    - *b.* Spears with detachable heads:
        - Indian fish-harpoons.
        - Other fish-harpoons.
    - (For accessory apparatus, see under 29.)

9. TONGS, &c.

† *For hand use.*

- *a.* Tongs (with two handles:)
    - Oyster-tongs.
    - Oyster-rakes.
- *b.* "Nippers," (with cord and handle.)
    - Snake-tongs.
    - Sponge-tongs.
    - Coral-tongs.

†† *For use with sounding-lines.*

- *c.* "Clamms" for deep-sea soundings, (forceps closed by a weight.)
    - (Ross's "Deep-sea clamms.")
    - (Bull-dog sounding-machine.)

*** *Grasping-lines.*

10. NOOSES.

† *Stationary nooses.*

- *a.* Jerk-snares:
    - Bird-snares.
    - Fish snares, of wire, gut, hair, &c.

†† *Thrown nooses.*

- *b.* Lariats and lassos:
    - Lariats with rope noose, made from hair, hemp, and rawhide.
    - Lariats with metal noose.
    - (Chilian bird-lariat.)

11. LOADED LINES. (Bolas.)
    - *a.* Bird-slings, used by Eskimos.
    - *b.* Bolas, with one or several weights.)

**** *Entangling lines.*

12. TANGLES.
    - *a.* Tangles:
        - Swab-tangles.
        - (Dredge-tangles, used by English collectors.)
        - Harrow-tangles.
        - Wheel-tangles.

III. MISSILES.

* *Simple missiles, (those propelled by the unaided arm.)*

13. HURLED WEIGHTS.
    - *a.* Stones and discs thrown by the hand.
    - *b.* Weights dropped from an elevation, (dead-falls, not automatic.)
14. HURLED STICKS.
    - *a.* Straight sticks:
        - Clubs used as missiles.
    - *b.* Curved sticks:
        - Throw-sticks, used by the Moqui Indians of New Mexico in hunting rabbits.
        - (Boomerangs.)
15. HURLED SPEARS.
    - *a.* Darts and lances.

** *Centrifugal missiles. (Propelling power augmented by an artificial increase of the length of the arm.)*

16. SLINGS AND SPEARS THROWN BY STRAPS.
    - *a.* Slings.
    - *b.* Spears, with straps used in throwing them.
17. MISSILES PROPELLED BY "THROWING-STICKS."
    - *a.* Spears with throwing-sticks, used by Eskimos:
        - Series of throwing or darting sticks.

*** *Missiles propelled by a spring.—‡ Spring consisting of bent rod.*

18. BOWS AND ARROWS.
    - *a.* Bows:
        - Simple bows.
        - (Cross-bows.)
        - (Ballistas.)
    - *b.* Arrows:
        - Lance-arrows.
        - Harpoon-arrows, used in fishing.
        - Blunt or club arrows, used in killing birds.
    - *c.* Accessories of bows and arrows:
        - Holders.
        - Quivers.
        - Arrow-head pouches.

18. BOWS AND ARROWS—Continued.
    - *d.* Implements of manufacture:
        - Flint-chipping apparatus.
        - Arrow-head sharpeners.
        - Shaft-gauges.
        - Cord-twisting apparatus.
        - Shaft-polishers.
        - Glue-sticks, used in fastening head of arrow.

‡‡ *Spring consisting of elastic cord.*

19. INDIA-RUBBER SLINGS.
    - *a.* Pea-shooters, used in killing birds.

‡‡‡ *Spring consisting of metallic helix.*

20. SPRING-GUNS.
    - *a.* Spring-guns.

**** *Missiles propelled by the compression of air or water.*

21. AIR-GUNS.
    - *a.* Blow-guns, (missile propelled by the breath:)
        - Blow-guns carrying arrows.
        - Blow-guns carrying balls.
    - *b.* Piston air-guns.
    - *c.* Reservoir air-guns:
        - Air-guns.
        - Air-gun canes.
22. WATER-GUNS.
    - *a.* Syringe-guns:
        - Humming-bird guns.

***** *Fire-arms.*

23. GUNS AND PISTOLS.
    - *a.* Muzzle-loading arms:
        - With smooth bores:
            - Muskets.
            - Fowling-pieces.
            - Cane-guns.
            - Pistols:
                - Single-barreled pistols.
                - Revolvers.
        - With grooved bores: Rifles.
            - Rifle-muskets.
            - Rifle-carbines.
            - Pistols.

23. GUNS AND PISTOLS—Continued.
    - *b.* Breech-loading arms:
        - With smooth bores:
            - Fowling-pieces.
            - Pistols.
        - With rifled bores:
            - Muskets.
            - Hunting rifles.
        - Carbines:
            - Single-barreled carbines.
            - Revolving carbines.
        - Pistols:
            - Pistols.
            - Revolvers.
    - *c.* Whaling-guns:
        - Bomb lance and gun.
        - Harpoon ball and gun.
        - Harpoon-gun.
        - Harpoon bomb-lance gun.

24. (ACCESSORY.) AMMUNITION AND ITS PREPARATION.
    - *a.* Explosives:
        - Gunpowder.
        - Gun-cotton.
        - Percussion powder:
            - Caps.
            - Needle percussion.
            - Primers.
        - Wood powder.
        - Dynamite or giant-powder.
        - Nitroglycerine.
        - Dualine.
        - Lithofracteur.
        - Colonia powder.
        - Other explosives.
    - *b.* Missiles:
        - Bullets.
        - (Accessory) bullet-molds.
        - Shot.
        - (Accessory) methods of manufacturing shot.

24. (ACCESSORY.) AMMUNITION, &c.—Continued.

- *b.* Missiles:
  - Explosive bullets, shells, &c.:
    - Bomb-lance.
    - Meigs's shells.
- *c.* Wadding:
  - Bulk wadding.
  - Prepared wads.
  - (Accessory) wad-cutters.
- *d.* Ammunition-measures:
  - Measures.
  - Shot-measures. } Attached to pouches and separate.
  - Powder-measures. } Attached to pouches and separate.
  - Weighing-scales.
- *e.* Prepared ammunition:
  - Cartridges:
    - Ball-cartridges.
    - Shot-cartridges.
    - Wire-cartridges.
    - (Accessory) paper-shells.
    - (Accessory) metallic shells.
- *f.* Methods of preparing cartridges:
  - Loaders.
  - Crimpers.
  - Cappers.

25. ACCESSORIES OF LOADING, CLEANING AND REPAIRING, SIGHTING, AND TESTING FIRE-ARMS.

- *a.* Instruments for cleaning, loading, &c.:
  - Rammers.
  - Swabs.
  - Charge-drawers, "worms."
- *b.* Sights, &c.:
  - Muzzle-sights:
    - Plain sights.
    - Slit-sights.
    - Globe-sights.
    - Peep-sights.
  - Breech-sights:
    - Plain sights.
    - Graduating sights.

25. ACCESSORIES OF LOADING, &c.—Continued.
- *b.* Sights, &c.:
  - Telescope-sights.
  - Levels, attached to guns
  - Wind-gauges.
- *c.* Targets:
  - Practice-targets.
  - "Gyro-trap" targets.
  - Pigeon-traps and accessories of pigeon-shooting.
- *d.* Recoil-checks.

26. FOR CARRYING ARMS AND AMMUNITION.
- *a.* Ammunition-holders:
  - Powder-holders:
    - Horns.
    - Flasks.
    - Canisters.
  - Shot-holders:
    - Pouches.
    - Belts.
  - Cartridge-holders:
    - Pouches.
    - Boxes.
    - Belts.
    - Vests.
  - Cap-holders:
    - Pouches.
    - Boxes.
    - Cap-straps, used by Indians.
- *b.* Weapon-holders:
  - Slings for arms:
    - Shoulder-slings.
    - Saddle-slings.
    - Holsters.
  - Belts:
    - Pistol-belts.
  - Racks and cases:
    - Gun-racks.
    - Gun-cases.

IV. BAITED HOOKS. ANGLING-TACKLE.

27. HOOKS WITH MOVABLE LINES.

- *a.* Tackle for surface-fishing:
  - Fly-fishing tackle.
  - Salmon-tackle.
  - Trout-tackle.
  - Black-bass tackle.
  - Shad-tackle.
  - Trolling-tackle:
    - Trolling-tackle.
    - Whiffing-tackle.
    - Drailing-tackle.
    - Gangs of hooks for minnow-bait.
  - Surf-tackle for throwing and hauling:
    - Striped-bass tackle.
    - Redfish or bass tackle.
    - Bluefish tackle.
  - Tide-drailing tackle:
    - Pasque and cuttyhunk bass-tackle.
- *b.* Tackle for fishing below the surface:
  - Short hand-gear:
    - Mackerel-gear.
  - Deep-sea gear:
    - Cod-gear.
    - Halibut-gear.
    - Flounder-gear.
    - Shark-gear.
    - Tautog-gear.
    - Other bottom-gear.
  - Bobs:
    - Eel-bobs.

28. HOOKS, WITH STATIONARY LINES.—SET TACKLE.

- *a.* Surface lines:
  - Spilliards, or floating-trawl lines.
- *b.* Bottom-set lines:
  - Trawl-lines, or bull-tows.

29. (ACCESSORY.) PARTS AND ACCESSORIES OF ANGLING-APPARATUS AND OF HARPOON AND SEINE LINES.

a. Hooks, including a full series of unmounted hooks, of recent and aboriginal manufacture.
- Plain hooks:
  - Fly-hooks.
  - Trout-hooks.
  - Salmon-hooks.
  - Cod and halibut hooks.
  - Hooks for general use.
  - Bass-hooks.
- Jigs and drails:
  - Mackerel-jigs.
  - Blue-fish drails of bone and metal of the various patterns, Newport, Noank, Providence, Provincetown, &c.
  - Block Island drails.
  - Pearl-squids of various patterns.
  - Bone-squids.
  - Metal-squids.
  - Petticoat-squids of flannel, &c.
- Spoon-baits, plain and fluted:
  - Bass-spoons.
  - Pickerel-spoons.
  - Trout-spoons.
  - Blue-fish spoons.
  - Other trolling-spoons.
- Artificial flies on hooks:
  - Salmon-flies for each month.
  - Trout-flies for each month.
  - (Accessory.) Fly-books.

b. Lines, (twisted and plaited:)
- Silk-lines.
- Grass-lines.
- Linen-lines.
- Cotton-lines.
- Cotton-hemp lines.
- Bark-lines.
- Manila-lines.
- Hide-lines.

29. (ACCESSORY.) ANGLING-APPARATUS, &c.—Continued.

- *b.* Lines, (twisted and plated:)
  - Gut-lines.
  - Lines made from sea-weed, (*Nereocystis Lütkeana,*) and used by natives of Alaska.
  - (Lines of sea-weed, (*Chorda filum,*) used similarly in Scotland.)
  - (Accessory.) Apparatus for twisting lines.
- *c.* Snoods, leaders, and traces:
  - "Cat-gut," (sheep,) snoods, and leaders.
  - Silk-worm-gut snoods.
  - Salmon-gut snoods.
  - Flax-snoods.
  - Gimp-snoods.
  - Wire-snoods.
  - "Sid-straps."
- *d.* Whalers' chains and lines:
  - Head chains and ropes.
  - Fin-chains.
  - Fluke chains and rings and ropes.
  - Head pike and ring.
  - (Accessory.) Blocks, pendants, cutting-blocks, &c.
- *e.* Sinkers:
  - Boat-shaped sinkers, plain and shearing.
  - Pipe-lead sinkers.
  - Bullet-sinkers.
  - Plummet-sinkers, sugar-loaf, pear-shaped, and double-taper.
  - Banker-sinkers.
  - Seine-sinkers, of chain, lead balls, lead rings, stone, &c.
  - (Accessory.) Molds for sinkers.
    - Jig-molds.
    - Other sinker-molds.
- *f.* Spreaders:
  - Chopsticks.
  - One-armed chopsticks, or "revolving booms."
- *g.* Floats:
  - Line-floats of wood, cork, and quill.
  - Harpoon-floats of bladder, inflated skin, and wood.
  - Seine-floats of cork, wood, glass, and rubber-tubing.
  - Keg and other floats for lobster-pots, gill-nets, &c.
  - Whale-line drag.

29. (ACCESSORY.) ANGLING-APPARATUS, &c.—Continued.

- *h.* Reels:
    - Simple reels for fly-fishing, with and without check.
    - Multiplying reels for bass-fishing, with and without check.
    - Other multiplying reels.
    - Gunwale-winches.
    - Dredge-line rollers.
    - Trawl-line rollers.
    - Seine-windlasses.
- *i.* Line-holders:
    - Winders.
    - Spools.
    - Whaleman's line-tub.
    - Tubs for trawl-lines.
    - Seine-reels.
- *k.* Rods:
    - Straight rods, of cane, wood, whalebone, &c.:
        - Salmon-rods.
        - Trout-rods.
        - Bass-rods.
        - Pickerel-rods.
        - Other rods.
        - Folding-rods.
        - Tips of rubber, whalebone, &c.
        - Tell-tales, used in trolling.
        - Tell-tales for fishing under the ice.
        - (Accessory) cases for rods and rod-tops.
- *l.* Swivels:
    - Box-swivels.
    - Hook-swivels.
    - Pot-gauge swivel.
    - Cod-line swivels.
    - Trawl buoy-rope swivels.
- *m.* Clearing-rings.
- *n.* Disgorgers.

V. NETS.

30. ENTANGLING-NETS.

a. Meshing-nets, (entangling in meshes:)

‡ BARRIER-NETS.

- Rabbit-nets, used by Indians of the Southwest.
- Bird mesh-nets.
- Gill-nets, used in great lakes.

‡ DRIFT-NETS.

† *Those drifting across the tide.*

- Shad gill-nets, used in southern rivers.
- Bass gill-nets.
- Salmon gill-nets.
- Mullet gill-nets.

†† *Those drifting along the tide.*

- Mackerel gill-nets.
- Herring gill-nets.

b. Pocket-nets, (entangling in pockets:)

- Trammel-nets.

31. ENCIRCLING-NETS.

a. Seines:

- Seal-seines.
- Manatee-seines.
- Shad-seines.
- Mullet-seines.
- Menhaden-seines.
- Bass-seines.
- Blue-fish seines.
- Capelin-seines.
- Herring-seines.
- Cod-seines.
- Lance-bunts.
- Baird collecting-seines.
- Bait-seines.
- "Fly-tail" seines of North Carolina.

b. Hoop-nets:

- Handle, or dip-nets:
  - Bull-nets, (worked with ropes and blocks.)

31. ENCIRCLING-NETS—Continued.

- *b.* Hoop-nets:
  - Handle or dip-nets:
    - Scoop-nets, (herring-nets, pound-scoops, car-scoops, &c.)
    - Landing-nets.
    - Eskimo auk-nets.
  - Baited hoop-nets:
    - Crab-nets.
- *c.* Trailing-nets:
  - Trawls:
    - Beam-trawl.
    - (Otter-trawl.)
  - Dredges:
    - Flange, or ordinary dredge.
    - Rake-dredge.
    - Oyster-scraper.
    - (Coral-dredge.)
  - Towing-nets:
    - Surface tow-nets.
- *d.* Folding or jerk nets:
  - Purse-nets:
    - Mackerel purse-seines, (pursed by weight.)
    - Menhaden purse-seines, (pursed by hand-ropes.)
  - Cast-nets:
    - Mullet cast-nets.
    - Pompano cast-nets.
    - Bait cast-nets.
  - Clap-nets for birds.
  - Rabbit-spring nets.
  - Spring-weirs, (St. Lawrence.)
  - Sieve-traps, (for birds.)
- *e.* (Accessory.) Parts of nets and apparatus for manufacture:
  - Raw material of nets.
  - Babiche. (See under D. 20.)
  - Netting-fibre.
  - Netting-twine.
  - Netting-needles.
  - Mesh-needles.
  - Hanging-needles.
  - Eskimo netting-needles.

VI. TRAPS.

32. PEN-TRAPS.
    - *a.* Pocket-traps:
        - Pitfalls:
            - Pits, covered.
            - Barrel-traps.
            - Jar mole-traps.
            - "Rabbit-tipe," used in England.
        - Salmon-baskets, (Columbia River.)
        - Salmon-weirs, (Upper Columbia River.)
        - River-weirs, with pockets:
            - Eel-traps.
        - Fish-slides:
            - Shad-slides, used in the rivers of North Carolina.
    - *b.* Labyrinth-traps:
        - Corrals.
        - Turkey-traps.
        - Weirs, or pounds:
            - Heart-pound.
            - Salmon-weir.
            - Virginia Indian weir, (figured by DeBry.)
            - Salmon hook-gill-net of the Saint Lawrence.
        - Funnel-traps:
            - Fish-pots.
            - Lobster-pots.
            - Eel-weirs, (with leaders.)
            - Eel-pots, (without leaders.)
            - Barrel-pots, for eels.
            - West India wicker fish-pots.
            - Set-nets.
            - Fykes, (set-nets with leaders.)
            - Bass-traps.
    - *c.* Door-traps:

        † *Closed by the falling of a door.*

        - Box-traps.
            - Rabbit-traps, (figure 4.)
            - Brick traps, (figure 4.)

32. PEN-TRAPS—Continued.
- *c.* Door-traps:
  - Box-traps:
    - Musquash traps, with hanging doors.
    - Rabbit-traps, for mouth of burrows.
    - Self-setting box-traps.
    - Double box-traps.
  - Spring-door traps.

†† *Closed by falling of whole trap.*

- Bowl-traps.
- Cob-house bird-traps.
- Pigeon-nets.

††† *Closed by falling of tide.*

- Bar-weirs.
- *d.* Sheaf-traps:
  - Sheaf-traps, (New York Harbor.)

33. CLUTCHING-TRAPS.
- *a.* Noose-traps:
  - Snares:
    - Footpath-snares.
    - Barrier-snares.
  - Springes.
  - "Round mouse-traps."
- *b.* Jawed traps:
  - "Steel traps:"
    - Newhouse traps:
      - No. 0. Rat-trap.
      - No. 1. Muskrat-trap.
      - No. 1½. Mink-trap.
      - No. 2. Fox-trap.
      - No. 3. Otter-trap.
      - No. 4. Beaver-trap.
      - No. 4½. Deer-trap.
      - No. 5. Small bear-trap.
      - No. 6. Great bear-trap.
  - Spring bird-nets.
  - (French bird-trap.)

34. FALL-TRAPS.
    - *a.* Crushing-traps:
        - Deadfalls.
        - Figure-four traps.
    - *b.* Piercing-traps:
        - Spear-falls.
        - Mole-traps.
        - Harpoon-traps.
    - *c.* Spring-hooks:
        - Pickerel-hooks.

35. MISSILE-TRAPS.
    - *a.* Cross-bow traps.
    - *b.* Spring-guns.

36. ADHESIVE PREPARATIONS.
    - *a.* Bird-lime, &c.
    - *b.* Hoods, boots, &c.

VII. APPARATUS FOR WHOLESALE DESTRUCTION.

37. POISONS.
    - *a.* Food poisons:
        - Phosphorus poisons.
        - Strychnine.
        - Arsenic.
        - Corrosive sublimate.
        - Cyanide of potassium.
        - Opium poisons.
    - *b.* Blood poison: Woorara

38. ASPHYXIATORS.
    - *a.* Apparatus for smoking-out.
    - *b.* (Apparatus for suffocating with fumes of sulphur.)
    - *c.* Apparatus for drowning-out.

39. TORPEDOES.

39½. STOMACH-SPRINGS.
    - *a.* Eskimo whalebone springs, used in killing bears.

VIII. HUNTING-ANIMALS.

40. HUNTING-MAMMALS.
    - *a.* Dogs.
    - *b.* Hunting-leopard. (*Cynailurus jubatus.*)

40. HUNTING-MAMMALS—Continued.
    - *c.* Weasels and ferrets.
    - *d.* Otters.

41. ACCESSORIES TO HUNTING-DOGS.
    - *a.* Dog-whips.
    - *b.* Dog-whistles.
    - *c.* Dog-collars.
    - *d.* Dog-food.
    - *e.* Dog-carts.
    - *f.* Dog-muzzles.

42. HUNTING-BIRDS.
    - *a.* Falcons.
    - *b.* Owls.
    - *c.* Cormorants, (*Carbo sinensis*, used in fishing in China.)

43. ACCESSORY TO HUNTING-BIRDS.
    - *a.* Hoods.
    - *b.* Perches.
    - *c.* Cormorant-collars.

44. HUNTING-FISHES.
    - *a.* Remora, used in West Indies and Australia.

IX. DECOYS AND DISGUISES.

45. BAITS.
    - *a.* Natural baits:
        - Flies and other insects. (This should include a collection of those insects which, as the favorite food of fishes, are imitated in making artificial flies.)
        - Worms.
        - Mollusks.
        - Salted baits, (prepared.)
        - Menhaden.
        - Herring.
        - Squids.
        - Clams, long.
        - Clams, hen.
        - Pea-roe of cod, (used in French sardine-fisheries, and largely exported.)
        - Grasshopper paste, used as a substitute for pea-roe.
        - Tolling baits, "stosh," &c.

45. BAITS—Continued.
- *a.* Natural baits:
- (Accessory) methods of preparing baits:
    - Bait-cutters.
    - Bait-mills.
    - Bait-ladles.
    - Wheelbarrows for bait-clams, (Nantucket.)
    - Bait boxes and cans.
    - Bait-needles.
- *b.* Artificial baits:
    - Trolling-spoons.
    - Spinners.
    - Squids and jigs.
    - "Bobs," used in southern waters.
    - Artificial flies.
- *c.* Accessory to *b*:
    - *a.* Fly-books.
    - *b.* Raw materials for making artificial flies.
    - *c.* Tools for making artificial flies.
- *d.* Pastes.

46. DECOYS.
- *a.* Scent-decoys.
- *b.* Sound-decoys:
    - Animal calls, whistles, &c.
    - Bird-calls.
- *c.* Sight-decoys:
    - Living decoy animals and birds.
    - Decoy-dogs, used in hunting ducks.
    - Stool-pigeons.
    - Tame decoy-ducks.
    - Tame decoy-brants.
    - Imitations of animals and birds:
        - Decoy swimming-birds.
        - Decoy-waders.
    - Imitations of fishes:
        - Lure-fish used in taking Mackinaw trout.
    - Blanket-decoys, (for antelopes.)
    - Lanterns and other apparatus for fire-hunting and fishing,
    - Lanterns for still-hunting.

46. DECOYS—Continued.
  - *c.* Sight-decoys:
    - Lanterns for weequashing, or fire-fishing, for eels.
    - Jack-lanterns for fishing.

47. COVERS.
  - *a.* Movable covers:
    - Masks:
      - Deer heads and antelope heads.
    - Movable copses.
    - Covers for hunter.
    - Covers for boats.
  - *b.* Stationary covers:
    - Hunting-lodges.

X. PURSUIT, ITS METHODS AND APPLIANCES.

48. METHODS OF TRANSPORTATION.
  - *a.* Personal aids:
    - Snow-shoes.
    - Skates.
    - Alpenstocks and staves.
    - Portable bridges.
  - *b.* Animal equipments:
    - Harness:
      - Horse-trappings.
      - Dog-harness.
      - Girths, sinches.
      - Bits, cabrestos, spurs.
    - Saddles:
      - Riding-saddles.
      - Pack-saddles.
      - Aparejos.
      - Riding-pads, (for buffalo-hunting.)
      - Fur-pack saddle, (Hudson's Bay Territory.)
    - Vehicles:
      - Deer-sledges.
      - Dog-sledges.
      - Wagons.
      - Dog-carts.
      - Fish-carts, used in Nantucket.

48. METHODS OF TRANSPORTATION—Continued.

c. Boats:

Hunting-boats, fishing-boats:

- Birch canoes.
- Canoes used by Indians of the northwest coast in whaling.
- Kyaks or bidarkas.
- Umiaks or bidarras.
- Indian raft-boats.
- Launches.
- Dug-outs.
- Portable (paper and canvas) boats.
- Duck-boats.
- Scows.
- Oyster-boats.
- Whale-boats.
- Seine-boats, (sea use.)
- Seine-boats of the lakes.
- Potomac seine-boats.
- Dorys, sharpies, and dingies.
- Pound-boats of the lakes.
- Italian fishing-boats, (California.)
- Pinkies, (Martha's Vineyard.)
- Adirondack boats.
- Alexandria Bay boats.
- Surf-boats.
- Whitehall boats.
- Oyster-canoes.
- Ducking-boats.
- Cat-rigged fishing-boats.
- Mackerel-smacks.
- Oyster-smacks.
- Menhaden-smacks.
- Menhaden-carryaways.
- Bank cod-smacks.
- Smacks with wells, used near the coast.
- Smacks employed in fish-trade.
- Whale-ships.
- Sealers.

48. METHODS OF TRANSPORTATION—Continued.

- *c.* Boats:
  - Herring-boats.
  - Mackinaw boats.
  - Huron boats.
  - Norwegian boats.
  - Pound-boats.
  - } Used in the Great Lake fisheries.
  - Oyster-pungies, (canoe and square-sterned,) employed on the Chesapeake.
  - Oyster police-boats.
- Steamers:
  - Mackerel-steamers.
  - Menhaden steam-mills.
  - Lake gill-net steamer.
  - Whale-steamers.
  - Sealing-steamers, &c.
- Accessory to fishing-vessels:
  - Rigging, masts, sails, cordage, pulleys, sockets.
  - Anchors, killicks, chains.
  - Sail-needles, palms, fids, marline-spikes.
  - Oar-locks, chocks, oar-rests.
  - Stepping-irons for whale-boats.
  - Crotches and oar-rests.
  - Paddles and oars.
  - Rudder-heads, wheels, tillers, &c.
  - Fog-horns, trumpets, drums, &c.
  - Cabin, blubber room, cooks' and binnacle lamps and jacket-lamps, signal, binnacle, and common lanterns.
  - Compasses, barometers, &c.
  - Astronomical instruments, sextants, quadrants, chronometers, hour and log glasses.

49. CAMP-OUTFIT.

- *a.* Shelter:
  - Lodges.
  - Tents.
  - Hunting-camps.
  - Hunters' houses.
  - Fishing-houses.

49. CAMP-OUTFIT—Continued.
  - *b.* Furniture:
    - Hammocks.
    - Beds, couches, stretchers, and lounges.
    - Blankets, rubber and Mackinaw, and fur robes.
    - Fuel.
    - Apparatus for kindling fire.
    - Lamps and lanterns.
    - Tools.
  - *c.* Commissary supplies:
    - Cooking-apparatus, kettles, and stoves.
    - Table-furniture.
    - Preserved meats, &c.

50. PERSONAL EQUIPMENTS.
  - *a.* Clothing:
    - Hunting-suits.
    - Cloth-suits.
    - Skin-skins.
    - Water-proof suits.
    - Oil-skin suits.
    - Boots, moccasins, leggings.
    - Water-proof boots.
    - Wading boots and stockings.
    - Riding-boots.
    - Moccasins.
    - Leggings.
    - Hats and caps.
    - Protection from insects:
      - Nets for beds and for face.
      - Ointments, (such as tar and sweet-oil.)
      - Smudges, (such as pyrethrum powder.)
      - Shields, breastplates, and defensive armor.
  - *b.* Trappings:
    - Belts.
    - Cross-belts.
    - Game-bags.
    - Game and fish baskets and slings.
    - Wallets for lines and other tackle.

50. PERSONAL EQUIPMENTS—Continued.

- *c.* Optical instruments, &c.:
  - Snow-goggles.
  - Telescopes.
  - Field-glasses, &c.
  - Water-telescopes.
- *d.* Medical outfit:
  - Medicine-chests.
  - Hunters' and fishermen's flasks.
- *e.* Artificial lights:
  - Lanterns for camp and ship use.
  - Torches.

SECTION C.

METHODS OF PREPARATION.

I. PREPARATION AND PRESERVATION OF FOOD

1. PRESERVATION DURING LIFE, (see under E, 3.)
2. PRESERVATION OF FRESH MEATS.
    - *a.* Refrigerators:
        - Ice-boxes and refrigerators.
        - Refrigerator-cars.
        - (Accessory.) The ice-trade:
            - Ice cutting and handling apparatus.
            - Methods of manufacturing artificial ice.
            - Ice-houses.
    - *b.* Other accessories of preservation:
        - Meat-hooks.
        - Skewers, &c.
        - Carving-tools.
3. PRESERVATION BY DRYING.
    - *a.* Sun-drying apparatus:
        - Beach dryers.
        - Flake-drying:
            - Newfoundland flakes.
            - Massachusetts flakes.
            - Covers for fish-drying.
    - *b.* Smoke-drying apparatus:
        - Herring smoke-houses.
        - Halibut smoke-houses.
        - Salmon smoke-houses.
        - Sturgeon smoke-houses.
        - Aboriginal drying-houses.
        - Methods of drying haliotis, used by the Indians of California.

4. PRESERVATION BY CANNING AND PICKLING.

- *a.* Salting fish:
    - Knives, (see under B, 2.)
    - Scaling-apparatus.
    - Tables, tubs, &c.
    - Barrels.
    - (Accessory.) Salt:
        - Specimens of the salts used in preserving fish.
        - Model of salt-mills used on Cape Cod in former days.
- *b.* Canning meats:
    - Model of salmon-canning establishment.
    - Model of sardine-factory.
    - (Accessory.) Cotton-oil, and its manufacture.
    - Model of lobster-canning factory.
    - Model of oyster-canning factory.

5. PREPARATION OF BAITS.

- *a.* Bait-mills, knives, choppers, &c., (see under B, 2 and 3.)
- *b.* Bait tubs, vats, &c.

II. MANUFACTURE OF TEXTILE FABRICS, FELTS, AND STUFFINGS.

6. PREPARATION OF WOOL AND HAIR OF MAMMALS.

- *a.* Preparation of wool cloths:
    - Washing.
    - Shearing.
    - Stapling or assorting.
    - Scouring.
    - Combing, carding, and plucking.
    - Spinning and reeling.
    - Weaving.
    - Fulling and teazling.
    - Cropping.
    - Pressing.
- *b.* Weaving worsted cloths.
- *c.* Felting and the hat manufacture:
    - Bowing.
    - Pressing.
    - Stopping.

6. PREPARATION OF WOOL, &c.—Continued.
    - *c.* Felting and the hat manufacture:
        - Rolling-off.
        - Shaping.
    - *d.* Preparation of curled hair for stuffings.

7. PREPARATION OF WHALEBONE.
    - *a.* Preparation of stuffings.

8. PREPARATION OF FEATHERS.
    - *a.* Preparation of down for stuffings.
    - *b.* Preparation of feather fabrics.
    - *c.* Preparation of "brillantine."
    - *d.* Preparation of or flocking for wall-paper, from refuse quills.
    - *e.* Preparation of fibres for manufacture of plush carpets.

9. PREPARATION OF SILK OF INSECTS.
    - *a.* Preparation of silk of silk-worms:
        - Boiling the cocoons.
        - Reeling.
        - Spinning.
        - Dyeing.
        - Weaving.

10. PREPARATION OF SOFT PARTS OF OTHER INVERTEBRATES.
    - *a.* Preparation of silk from byssus of *Pinna.*
    - *b.* Preparation of sponge stuffing.

III. PREPARATION OF THE SKIN AND ITS APPENDAGES.

11. CURRYING OF LEATHER.
    - *a.* Processes of currying:
        - Dipping.
        - Graining.
        - Scraping.
        - Dressing.
    - *b.* Implements employed by curriers:
        - "Head-knives."
        - "Pommels."
        - "Stretching-irons."
        - "Round-knives."
        - "Cleaners."

11. CURRYING OF LEATHER—Continued.
    - *b.* Implements employed by curriers:
        - "Maces."
        - "Horses," or trestles.
        - "Dressers."
        - "Treading-hurdles."
    - *c.* Eskimo and Indian currying methods and implements.
    - *d.* Methods of dressing gut and sinew.

12. LEATHER-DRESSING.
    - *a.* Processes of tanning leather:
        - Soaking.
        - Liming.
        - Tanning.
    - *b.* Processes of tawing or oil-dressing leather:
        - Soaking.
        - Liming.
        - Oiling.
    - *c.* Apparatus of leather-dressing, recent and aboriginal.

13. FUR-DRESSING.
    - *a.* Processes of fur-dressing:
        - Currying. (See under 12.)
        - Scouring.
        - Tanning.
        - Lustering.
        - Plucking and dyeing.

14. FEATHER-DRESSING.
    - *a.* Method of preparing ornamental feathers:
        - Scouring.
        - Bleaching.
        - Washing.
        - Azuring.
        - Sulphuring.
        - Scraping.
        - Dyeing.
    - *b.* (Art of plumagery.)

15. MANUFACTURE OF QUILL ARTICLES.
    - *a.* Manufacture of quills for pens:
        - Sand-bath drying and steaming.
        - Polishing.

15. MANUFACTURE OF QUILL ARTICLES—Continued.
    - *a.* Manufacture of quills for pens:
        - Dyeing.
        - Shaping.
    - *b.* Manufacture of tooth-picks.
    - *c.* Manufacture of floats and other articles.
    - *d.* Manufacture of quill brush-bristles.

16. HAIR AND WOOL WORK.

IV. PREPARATION OF HARD TISSUES.

17. IVORY CUTTING AND CARVING.
    - *a.* Manufacture of handles, trinkets, billiard-balls, &c.:
        - Turning and sawing.
        - Polishing.
        - Bleaching.
    - *b.* Manufacture of organ and piano keys:
        - Sawing.
        - Strip-sawing.
        - Polishing.
        - Bleaching, &c.
    - *c.* Other processes.

18. PREPARATION OF HORN AND HOOF.
    - *a.* Steaming.
    - *b.* Pressing.

19. PREPARATION OF WHALEBONE.
    - *a.* Cutting and other processes.
    - *b.* Manufacture of whip-makers' stock and whips.
    - *c.* Manufacture of umbrella-maker's bone.
    - *d.* Manufacture of ribbon-weaver's bone.
    - *e.* Manufacture of hat and bonnet maker's bone.
    - *f.* Manufacture of suspender-maker's bone.
    - *g.* Manufacture of stock-maker's bone.
    - *h.* Manufacture of dress and stay maker's bone.
    - *i.* Manufacture of billiard-table cushions.
    - *k.* Manufacture of surgical instruments.
    - *l.* Manufacture of whalebone-brushes.
    - *m.* Manufacture of rosettes, woven-work, and trinkets.
    - *n.* Other whalebone manufactures.

20. PREPARATION OF TORTOISE-SHELL.

21. PREPARATION OF FISH-SCALE WORK.
22. PREPARATION OF NACRE.
23. PREPARATION OF CORAL.
24. PREPARATION OF OTHER HARD TISSUES

V. OILS AND GELATINES.

25. EXTRACTION OF WHALE OIL, (WITH MODELS OF TRY-WORKS, CLARIFYING-VATS, &c.)
    - *a.* Preparation of body-oil:
        - Cutting in and stowing.
        - Leaning and mincing.
        - Trying.
        - Bailing.
        - Cooling.
        - Barreling.
        - Refining.
    - *b.* Preparation of head-oil.
    - *c.* Preparation of spermaceti.
    - *d.* Instruments and appliances of rendering whale oil:
        - Boarding-knives.
        - Leaning-knives.
        - Mincing-horse and mincing-knives.
        - Mincing-tub.
        - Mincing-machine.
        - Blubber-fork.
        - Try-pots.
        - Fire-pike.
        - Stirring-pole.
        - Scrap-hopper.
        - Skimmer.
        - Bailer.
        - Cooler.
        - Deck-pot.
        - Casks.
26. EXTRACTION OF OTHER MAMMAL OILS.
27. EXTRACTION OF BIRD AND REPTILE OILS.
28. EXTRACTION OF FISH-OILS, (WITH MODELS OF BOILERS, PRESSES, CLARIFYING-VATS, &c.)
29. EXTRACTION OF GLUE, GELATINE, AND ISINGLASS.

VI. DRUGS, PERFUMES, AND CHEMICAL PRODUCTS.

30. MANUFACTURE OF PERFUMES.
31. MANUFACTURE OF IVORY-BLACK.
32. MANUFACTURE OF PRUSSIATES.
33. MANUFACTURE OF MUREXIDES.
34. PREPARATION OF COCHINEAL COLORS.
35. MANUFACTURE OF INKS FROM ANIMAL SUBSTANCES.
36. PREPARATION OF ALBUMEN.
37. MANUFACTURE OF PEPSIN.
38. MANUFACTURE OF PHOSPHORUS.
39. MANUFACTURE OF SAL AMMONIAC.
40. MANUFACTURE OF AMMONIA.
41. MANUFACTURE OF ALBUMEN PREPARATIONS.
42. MANUFACTURE OF PROPYLAMINE.
43. MANUFACTURE OF FORMIC ACID.
44. MANUFACTURE OF CARBAZOTATES.

VII. MANUFACTURE OF FERTILIZERS.

45. PREPARATION OF GUANO.
   a. Model of fish-guano works:
      Grinders and pulverizers.
      Mixers.
      Guano in its various stages, with its ingredients, South Carolina phosphates, Navassa phosphates, scrap, (crude, and dried,) sulphuric acid, kainite, screened and unscreened guano, and sea-weed used in preparation.

VIII. LIMES.

46. BURNING OF LIME.
   a. Models of kilns for burning shells.

IX. PRESERVATION OF THE ANIMAL FOR SCIENTIFIC USES.

47. APPARATUS FOR MAKING AND PRESERVING ALCOHOLIC SPECIMENS.
   a. Tanks and jars:
      Agassiz collecting-tank.

47. APPARATUS FOR MAKING AND PRESERVING ALCOHOLIC SPECIMENS—Continued.

- *a.* Tanks and jars:
    - Army collecting-tank.
    - Museum storage-tank, Agassiz model.
    - Anatomical jars.
    - Self-sealing jars, used in collecting.
    - Phials.
    - Tube-phials.
- *b.* Syringes for injecting.
- *c.* Inflatable bags.
- *d.* Preservative mixtures:
    - Alcohol.
    - Glycerine.
    - Carbolic acid.
    - Chloral hydrate.
    - Picric acid.
    - Osmic acid.
- *e.* Labels:
    - Metallic labels.
    - Parchment labels.
    - Indelible inks, pencils, &c.

48. APPARATUS FOR PRESERVING AND MAKING SKELETONS.

- *a.* Preparation of the bones:
    - Macerating-vats.
    - Boiling-vats.
    - Cleansing and bleaching preparation.
- *b.* Mounting of the bones:
    - Scraping-tools.
    - Articulating-tools.

49. APPARATUS FOR MAKING CASTS. MODELING.

- *a.* Materials:
    - Clays.
    - Plasters.
    - Glues.
    - *Papier-maché* and *carton pierre.*
    - Gelatine.
    - Paraffine.
    - Collodion.

49. APPARATUS FOR MAKING CASTS, &c.—Continued.
  - *b.* Frames and modeling tools.
  - *c.* Molds:
    - Of plaster.
    - Of gelatine.
    - Of paper.
    - Of paraffine.

50. APPARATUS AND METHODS OF MAKING AND MOUNTING SKINS. TAXIDERMY.
  - *a.* Tools:
    - Flaying-tools.
    - Scraping-tools.
    - Taxidermists' tools for stuffing:
      - Forceps.
      - Pliers.
  - *b.* Preservatives and insect-powders:
    - Arsenic and arsenical soap.
    - Corrosive sublimate.
    - Salt, alum, &c.
    - Persian insect-powder.
      - Syringes for application of insect-powder.
    - Tobacco, snuff, used as preservatives.
  - *c.* Frames, &c.:
    - Wooden frames.
    - Wire frames.
    - Plaster model-bodies.

51. (ACCESSORY.) PHOTOGRAPHIC AND OTHER DELINEATING APPARATUS.
  - *a.* Photographic apparatus:
    - Lenses.
    - Cameras and fittings.
    - Camera tripods and stands, with model.
    - Fish Commission stands.
    - Plates, and their results:
      - Wet plates.
      - Dry plates.
      - Dark closets.
  - *b.* Camera obscuras.
  - *c.* Mechanical delineators.
  - *d.* Methods of heliotyping and engraving illustrations.

SECTION D.

ANIMAL PRODUCTS AND THEIR APPLICATIONS.

I. FOODS.

1. FOODS IN A FRESH CONDITION.

This section may include specimens of the marketable animals in a fresh condition in refrigerators.

For convenience in making up and arranging this portion of the collection, a list is appended of the animals used as food in the United States. Many others are available, but for various reasons are not commonly eaten.

a. Mammals:

Grizzly bear, (*Ursus horribilis.*)
Black bear, (*Ursus americanus.*)
White bear, (*Thalarctos maritimus.*)
Raccoon, (*Procyon lotor.*)
Buffalo, (*Bison americanus.*)
Musk-ox, (*Ovibos moschatus.*)
Mountain goat, (*Mazama montana.*)
Mountain sheep, (*Ovis montana.*)
Antelope, (*Antilocapra americana.*)
Moose, (*Alces malchis.*)
Woodland caribou, (*Tarandus rangifer*, subsp. *caribou.*)
Barren-ground caribou, (*Tarandus rangifer*, subsp. *grœnlandicus.*)
Elk or wapiti, (*Cervus canadensis.*)
Virginia deer, (*Cariacus virginianus.*)
Mule-deer, (*Cariacus macrotis.*)
Black-tailed deer, (*Cariacus columbianus.*)
Peccary, (*Dicotyles torquatus.*)
Manatee, (*Trichechus manatus.*)
Fox squirrel, (*Sciurus cinereus.*)
Gray squirrel, (*Sciurus carolinensis.*)

1. FOODS IN A FRESH CONDITION—Continued.

a. Mammals:

- California gray squirrel, (*Sciurus fossor.*)
- Tuft-eared squirrel, (*Sciurus Aberti.*)
- Red squirrel, (*Sciurus hudsonius.*)
- Flying squirrel, (*Sciuropterus volucella.*)
- Woodchuck, (*Arctomys monax.*)
- Marmots, (*Arctomys caligatus* and *flaviventer.*)
- Polar hare, (*Lepus timidus*, var. *arcticus.*)
- Prairie hare, (*Lepus campestris.*)
- Northern hare or white rabbit, (*Lepus americanus*, and *L. americanus* var. *virginianus.*)
- Red hare, (*Lepus americanus*, var. *Washingtoni.*)
- Baird's hair, (*Lepus americanus*, var. *Bairdii.*)
- Gray hare or gray rabbit, (*Lepus sylvaticus.*)
- Sage rabbit, (*Lepus sylvaticus*, var. *Nuttalli.*)
- Audubon's hare, (*Lepus sylvaticus*, var. *Auduboni.*)
- Trowbridge's hare, (*Lepus Trowbridgei.*)
- Jack rabbit or mule rabbit, (*Lepus callotis.*)
- California hare, (*Lepus californicus.*)
- Marsh hare, (*Lepus palustris.*)
- Water hare, (*Lepus aquaticus.*)
- Opossum, (*Didelphys virginiana.*)

b. Birds:

- Reed bird or rice bird, (*Dolichonyx oryzivorus.*)
- Wild pigeon, (*Ectopistes migratorius.*)
- Turkey, (*Meleagris gallopavo.*)
- Wild turkey, (*Meleagris gallopavo*, var. *americana.*)
- Spruce grouse, (*Tetrao canadensis.*)
- Dusky grouse, (*Tetrao obscurus.*)
- Sage cock, (*Centrocercus urophasianus.*)
- Sharp-tailed grouse, (*Pediœcetes phasianellus.*)
- Prairie grouse or prairie hen, (*Cupidonia cupido.*)
- Ruffed grouse, (*Bonasa umbellus.*)
- Snow ptarmigan, (*Lagopus albus.*)
- Rock ptarmigan, (*Lagopus rupestris.*)
- White-tailed ptarmigan, (*Lagopus leucurus.*)
- Bob-white or "quail," (*Ortyx virginianus.*)
- Plumed partridge, (*Oreortyx pictus.*)

1. FOODS IN A FRESH CONDITION—Continued.
   b. Birds:
      - California partridge, (*Lophortyx californicus.*)
      - Gambel's partridge, (*Lophortyx Gambeli.*)
      - Scaled partridge, (*Callipepla squamata.*)
      - Massena partridge, (*Cyrtonyx massena.*)
      - Black-billed plover, (*Squatarola helvetica.*)
      - Golden plover, (*Charadrius fulvus* var. *virginicus.*)
      - Kildeer plover, (*Aegialitis vociferus.*)
      - Wilson's plover, (*Aegialitis wilsonius.*)
      - Ringneck plover, (*Aegialitis semipalmatus.*)
      - Piping plover, (*Aegialitis melodus.*)
      - Stilt sandpiper, (*Micropalama himantopus.*)
      - Ruddy plover, (*Calidris arenaria.*)
      - Woodcock, (*Philohela minor.*)
      - American snipe, (*Gallinago wilsoni.*)
      - Red-breasted snipe, (*Macrorhamphus griseus.*)
      - Willet, (*Totanus semipalmatus.*)
      - Tell-tale, (*Totanus melanoleucus.*)
      - Yellow-shanks, (*Totanus flavipes.*)
      - Upland plover, (*Actiturus bartramius.*)
      - Long-billed curlew, (*Numenius longirostris.*)
      - Hudsonian curlew, (*Numenius hudsonicus.*)
      - Eskimo curlew, (*Numenius borealis.*)
      - Clapper rail, (*Rallus longirostris.*)
      - Marsh hen, (*Rallus elegans.*)
      - Virginia rail, (*Rallus virginianus.*)
      - Carolina rail, (*Porzana carolina.*)
      - Yellow rail, (*Porzana noveboracensis.*)
      - Trumpeter-swan, (*Cygnus buccinator.*)
      - Whistling swan, (*Cygnus americanus.*)
      - White-fronted goose, (*Anser albifrons.*)
      - Snow goose, (*Anser hyperboreus.*)
      - Brant, (*Branta bernicla.*)
      - Canada goose, (*Branta canadensis.*)
      - Mallard, (*Anas boschas.*)
      - Black duck, (*Anas obscura.*)
      - Pintail duck, (*Dafila acuta.*)
      - Gray duck, (*Chaulelasmus streperus.*)

1. FOODS IN A FRESH CONDITION—Continued.

- *b.* Birds:
  - Widgeon or bald pate, (*Mareca americana.*)
  - Green-winged teal, (*Querquedula carolinensis.*)
  - Blue-winged teal, (*Querquedula discors.*)
  - Red-breasted teal, (*Querquedula cyanoptera.*)
  - Shoveller, (*Spatula clypeata.*)
  - Wood duck,(*Aix sponsa.*)
  - Big black-head, (*Fuligula marila.*)
  - Little black-head, (*Fuligula affinis.*)
  - Ring-necked duck, (*Fuligula collaris.*)
  - Red-head, (*Fuligula ferina*, var. *americana.*)
  - Canvas-back, (*Fuligula vallisneria.*)
  - Golden-eye, (*Bucephala clangula.*)
  - Barrow's golden-eye, (*Bucephala islandica.*)
  - Butter-ball, (*Bucephala albeola.*)
  - Long-tail duck, (*Harelda glacialis.*)
  - Harlequin-duck, (*Histrionicus torquatus.*)
  - Eider duck, (*Somateria mollissima.*)
  - King eider, (*Somateria spectabilis.*)
  - Scoter, (*Œdemia americana.*)
  - Velvet duck, (*Œdemia fusca*, var. *velvetina.*)
  - Surf duck, (*Œdemia perspicillata.*)
  - Long-billed scoter, (*Œdemia perspicillata* var. *Trowbridgei.*)
  - Ruddy duck or bar duck, (*Erismatura rubida.*)
  - Sheldrake, (*Mergus merganser.*)
  - Red-breasted merganser, (*Mergus serrator.*)
  - Hooded merganser,(*Mergus cucullatus.*)
- *c.* Reptiles:
  - Gopher tortoise, (*Testudo carolina.*)
  - Diamond-back terrapin, (*Malacoclemmys palustris.*)
  - Red-bellied terrapins, (*Pseudemys rugosa.*)
  - Florida river-terrapin, (*Pseudemys concinna.*)
  - Alligator turtle, (*Macrochelys lacertina.*)
  - Snapping turtle,(*Chelydra serpentina.*)
  - Soft-shell, or leather-back turtle, (*Aspidonectes ferox*, &c.)
  - Green turtle, (*Chelonia mydas.*)
  - Pacific green turtle, (*Chelonia virgata.*)
  - Loggerhead turtle, (*Thalassochelys caouana.*)

1. FOODS IN A FRESH CONDITION—Continued.

d. Amphibians:

- Frogs, (*Rana catesbiana*, *clamitans*, &c.)

e. Fishes, (eastern coast:)

- File fish, (*Balistes capriscus.*)
- American sole, (*Achirus lineatus.*)
- Flat fish, (*Pseudopleuronectes americanus.*)
- Smooth flounder, (*Pleuronectes glaber.*)
- Sand flounder, (*Lophopsetta maculata.*)
- Flounder, (*Chænopsetta ocellaris.*)
- Southern flounder, (*Chænopsetta dentata.*)
- Four-spotted flounder, (*Chænopsetta oblonga.*)
- Halibut, (*Hippoglossus americanus.*)
- Newfoundland "Turbot," (*Reinhardtius hippoglossoides.*)
- Pollack, (*Pollachius carbonarius.*)
- Cod, (*Gadus morrhua.*)
- Tom-cod, or frost fish, (*Microgadus tomcodus.*)
- Haddock, (*Melanogrammus æglefinus.*)
- Hake, (*Phycis chuss.*)
- Squirrel hake, (*Phycis tenuis.*)
- Cusk, (*Brosmius americanus.*)
- Whiting, (*Merlucius bilinearis.*)
- Norway haddock, (*Sebastes norvegicus.*)
- Rose fish, (*Sebastes viviparus.*)
- Tautog, or black-fish, (*Tautoga onitis.*)
- Chogset, or cunner, (*Tautogolabrus adspersus.*)
- Hog fish, (*Lachnolæmus falcatus.*)
- Angel fish, (*Holacanthus ciliaris.*)
- Sword fish, (*Xiphias gladius.*)
- Spear fish, (*Tetrapturus albidus.*)
- Sail fish, (*Histiophorus americanus.*)
- Mackerel, (*Scomber scombrus.*)
- Chub mackerel, (*Scomber colias.*)
- Bonito, (*Sarda pelamys.*)
- Horse mackerel, (*Orcynus secundi-dorsalis.*)
- Spanish mackerel, (*Cybium maculatum.*)
- Cero, (*Cybium caballa.*)
- Striped cero, (*Cybium regale.*)
- Crevallé. (*Carangus hippos* and *Paratractus pisquetus.*)

1. FOODS IN A FRESH CONDITION—Continued.

   e. Fishes, (eastern coast:)

   - Pompano, (*Trachynotus carolinus.*)
   - Short pompano, (*Trachynotus ovatus.*)
   - Butter-fish, (*Poronotus triacanthus.*)
   - Squeteague, (*Cynoscion regalis.*)
   - Spotted squeteague, (*Cynoscion carolinensis.*)
   - Drum, (*Pogonias chromis.*)
   - Spot, (*Liostomus obliquus.*)
   - Silver perch, or yellow-tail, (*Bairdiella punctata.*)
   - Red fish, or spotted bass, (*Sciænops ocellatus.*)
   - King fish, (*Menticirrus nebulosus.*)
   - Southern king fish, or Bermuda whiting, (*Menticirrus alburnus.*)
   - Croaker, (*Micropogon undulatus.*)
   - Sailor's choice, (*Lagodon rhomboides.*)
   - Sheeps-head, (*Archosargus probatocephalus.*)
   - Scuppaug, or porgy, (*Stenotomus argyrops.*)
   - Grunts, (*Hæmulon arcuatum*, &c.)
   - Gray snapper, (*Lutjanus caxis.*)
   - Red snapper, (*Lutjanus aya.*)
   - Grouper, (*Epinephelus morio.*)
   - Spotted grouper, (*Epinephelus guttatus.*)
   - Jew fish, (*Promicrops guasa.*)
   - Sea bass, (*Centropristis atrarius.*)
   - Squirrel, (*Diplectrum fasciculare.*)
   - Striped bass or rock fish, (*Roccus lineatus.*)
   - White perch, (*Morone americana.*)
   - Moon fish, (*Parephippus quadratus* and *P. faber.*)
   - Triple-tail, (*Lobotes surinamensis.*)
   - Blue fish, (*Pomatomus saltatrix.*)
   - Striped mullet, (*Mugil lineatus.*)
   - Silver-sides, (*Chirostoma notatum.*)
   - Silver gar fish, (*Belone longirostris.*)
   - Skipper, (*Scomberesox scutellatus.*)
   - Mummichogs, (*Hydrargyra majalis*, &c.)
   - Capelin, (*Mallotus villosus.*)
   - Smelt, (*Osmerus mordax.*)
   - Salmon, (*Salmo salar.*)

1. FOODS IN A FRESH CONDITION—Continued.

e. Fish, (eastern coast:)

- Sea trout, (*Salmo immaculatus.*)
- Tarpum, (*Megalops thrissoides.*)
- Menhaden, (*Brevoortia menhaden.*)
- Shad, (*Alosa sapidissima.*)
- Alewife, or gaspereau, (*Pomolobus pseudoharengus.*)
- Tailor herring, (*Pomolobus mediocris.*)
- Herring, (*Clupea harengus*)
- Mud shad, (*Dorosoma cepedianum.*)
- Anchovy, (*Engraulis vittatus*, &c.)
- Sea eel or conger, (*Conger oceanica.*)
- Eel, (*Anguilla bostoniensis.*)
- Sturgeon, (*Acipenser oxyrhynchus* and *A. brevirostris.*)
- Lamprey eel, (*Petromyzon americanus.*)

f. Fishes, (fresh waters:)

- Burbot or lawyer, (*Lota maculosa.*)
- Fresh-water drum, (*Haploidonotus grunniens.*)
- Small-mouthed black-bass, (*Micropterus salmoides.*)
- Large-mouthed black-bass, (*Micropterus floridanus.*)
- Rock-bass, (*Ambloplites rupestris.*)
- Sacramento "perch," (*Archoplites interruptus.*)
- Sun-fish, (*Pomotis aureus.*)
- Black-eared sunfish, (*Pomotis auritus.*)
- "Bream" of Southern States, (*Calliurus*, *Lepomis*, *Enneacanthus*, *Chænobryttus*, numerous species.)
- Strawberry or grass bass, (*Hyperistius hexacanthus*, and *Pomoxys storerius.*)
- Yellow perch, (*Perca flavescens.*)
- Yellow pike-perch, (*Stizostedium americanum.*)
- Gray pike-perch or sauger, (*Stizostedium griseum.*)
- Canada pike-perch, (*Stizostedium canadense.*)
- White bass, (*Roccus chrysops.*)
- Short-striped bass, (*Morone interrupta.*)
- Lake pike, (*Esox lucius.*)
- Pickerel, (*Esox reticulatus*, *E. fasciatus*, *E. cypho*, &c., &c.)
- Masquallonge, (*Esox nobilior.*)
- Brook trout, (of eastern slope,) (*Salmo fontinalis.*)
- Brook trout, (of western slope,) (*Salmo iridea.*)

1. FOODS IN A FRESH CONDITION—Continued.

f. Fish, (fresh waters:)

- Utah trout, (*Salmo virginalis.*)
- Oquassa trout, (*Salmo oquassa.*)
- Lake trout, (*Salmo çonfinis.*)
- Salmon trout or Mackinaw trout, (*Salmo namaycush.*)
- Siscowet, (*Salmo siscowet.*)
- Sebago salmon, (*Salmo sebago.*)
- Missouri trout, (*Salmo Lewisi.*)
- White fish, (*Coregonus albus.*)
- Otsego white fish, (*Coregonus otsego.*)
- Lake herring, (*Argyrosomus harengus* and *A. clupeiformis.*)
- Black fin of Lake Michigan, (*Argyrosomus nigripinnis.*)
- Michigan grayling, (*Thymallus tricolor.*)
- Mountain grayling, (*Thymallus montanus.*)
- Suckers of eastern slope, (*Catostomus teres*, &c., *Ptychostomus aureolus*, &c.)
- Suckers of western slope, (*Catostomus occidentalis*, &c.)
- Fall fish, (*Semotilus rhotheus.*)
- Chubs of eastern slope, (*Semotilus corporalis*, &c.)
- Chubs of western slope, (*Lavinia exilicauda, Algansea*, sp., &c.)
- "Pike" or "salmon trout" of California, (*Ptychocheilus grandis*, &c., *Pogonichthys inæquilobus*, &c.)
- Dace, (*Ceratichthys biguttatus*, &c.)
- Buffalo fish, (*Bubalichthys bubalus.*)
- Shiner, (*Stilbe americana.*)
- Carp, (*Carpiodes cyprinus*, &c.)
- Catfishes, (*Amiurus catus, A. nigricans*, &c., *Ictalurus cærulesceus*, &c., and many other siluroid fishes.)
- Sturgeon of the lakes, (*Acipenser rubicundus.*)
- Shovel-nose sturgeon, (*Scaphirhynchops platyrhynchus.*)

g. Fishes, (western coast:)

- Flounders, (*Platichthys stellatus, Lepidopsetta umbrosa*, &c.)
- "Soles," (*Parophrys vetulus, Psettichthys melanostictus*, &c.)
- Halibut, (*Uropsetta californiana, Hippoglossus*, sp., &c.)
- Tomcod, (*Microgadus proximus.*)
- Cod of Alaska, (*Gadus macrocephalus.*)
- Rock fish or "rock cod," (*Sebastomus rosaceus* and species of *Sebastosomus, Sebastichthys*, &c.)

1. FOODS IN A FRESH CONDITION—Continued.
    - *g.* Fishes, (western coast:)
        - Rock trout, (*Chirus constellatus.*)
        - "Cod" of San Francisco, (*Ophiodon elongatus.*)
        - Black fish or "sheeps-head," (*Pimelometopon pulcher.*)
        - "Perch," (numerous species of *Embiotoca*, *Holconotus*, &c.)
        - "Bass," (*Atractoscion nobilis.*)
        - Cognard or little bass, (*Genyonemus lineatus.*)
        - San Francisco "smelt," (*Atherinopsis californiensis.*)
        - Pacific smelt, (*Osmerus elongatus.*)
        - Salmon, (*Salmo quinnat*, &c.)
        - Oulachan, (*Thaleichthys pacificus.*)
        - Sardine or pilchard, (*Pomolobus cæruleus.*)
        - Herring, (*Clupea mirabilis.*)
        - Sturgeon, (*Acipenser acutirostris*, &c.)
        - Columbia River sturgeon, (*Acipenser transmontanus.*)
    - *h.* Crustaceans.[1]
    - *i.* Mollusks.[1]
2. FOODS: DRIED AND SMOKED.
    - *a.* Mammal preparations:
        - Jerked bear-meat.
        - Jerked seal and walrus meat, (Indian.)
        - Jerked and smoked buffalo-meat.
        - Dried and smoked beef.
        - Dried and smoked venison.
        - Hams of various kinds.
        - Jerked porpoise-meat, (Indian.)
        - Jerked squirrels and other small mammals.
        - Pemmican.
        - Meat-biscuit, desiccated meat, meat extract, (*extractum carnis*,) desiccated milk, &c.
        - Sausages.
        - Cheese.
    - *b.* Bird preparations:
        - Jerked birds, (Indian.)

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[1] The various applications of these groups are enumerated in the "*List intended to give a general idea of the useful products (other than vertebrates) of the sea and shore, as well as of the interior waters of the United States,*" prepared by Mr. WM. H. DALL, and printed as Circular No. 2 of series (C,) National Museum series.

2. FOODS: DRIED AND SMOKED—Continued.

  c. Reptile preparations:
    - Dried lizards, (Indian.)

  d. Fish preparations:
    - Smoked halibut.
    - Dried cod, haddock, hake, &c.
    - Dried and smoked mullet and roes.
    - Dried and smoked garfish, flying-fish, &c.
    - Smoked herring, alewives, &c., and their roes.
    - Smoked salmon, oulachan, white-fish, smelt, &c., and their roes.
    - Smoked sturgeon.
    - *Veziga*, prepared from the notochord of sturgeons.

  e. Insects:
    - Dried grasshoppers, (Indian.)

  f. Worms:
    - Dried worms, (Indian.)

  g. Mollusk preparations:
    - Dried abalones, (*Haliotis*,) prepared by the California Chinese.
    - Dried siphons of *Schizothærus* prepared by the Indians of the northwest coast.
    - Dried slugs, (*Limax*, &c.,) used by Indians.

  h. Radiate preparations:
    - (Dried holothurians, "bêches de mer," used by Chinese.)

  i. Protozoans:
    - ("Mountain meal," a kind of infusorial earth, mixed with flour, and used as food in Lapland and China.)

3. FOODS: SALTED, CANNED, AND PICKLED.

  a. Mammal preparations:
    - Salted buffalo-meat.
    - Salted beef.
    - Salted deer, reindeer, elk.
    - Salted tongues of beef, buffalo, deer, horse.
    - Salted pork.
    - Canned milk of the various brands.

  b. Bird preparations:
    - Canned turkey.
    - Canned chicken.
    - Canned goose.

3. FOODS: SALTED, CANNED, AND PICKLED—Continued.

b. Bird preparations:

(Canned ortolans, (*Emberiza hortularia*,) esteemed a delicacy in Cyprus.)

c. Reptile preparations:

Salted and canned turtles and turtle soup.
Canned frogs.

d. Fish preparations:

Salted halibut, halibuts' fins, &c.
Salted cod, cods' tongues, sounds, and roe.
Salted mackerel.
Salted Spanish mackerel.
Salted bluefish.
Salted pompano.
Salted sword-fish.
Salted mullets.
Salted salmon.
Salted white-fish.
Salted trout.
Salted shad.
Salted herring.
Salted gaspereau.
Salted menhaden.
Salted anchovies.
(Spiced lampreys) used in Europe.
Anchovy-sauce and "essence of anchovies."
Canned menhaden, in oil, "American sardines."
Canned menhaden, in oil, "American club-fish."
Spiced menhaden, "ocean trout."
Canned herring, in oil, "Russian sardines."
Caviare, prepared from roe of the various sturgeons.
(Caviare, prepared from roe carps, used by Jews.)
("Boutargue" or "botargo" prepared on the Mediterranean from the roes of *Labrax* and *Mugil*.)

e. Crustacean preparations:

Canned lobsters.
Canned crabs.
Canned prawns and shrimps.

f. Mollusk preparations:

Canned oysters.

3. FOODS: SALTED, CANNED, AND PICKLED—Continued.
  - *f.* Mollusk preparations:
    - Canned clams.
    - Canned little-neck clams.
    - Canned scollops.
    - (Cockles, (*Cardium edule*,) used in Europe as pickles and catsup.)

4. GELATINES.
  - *a* Mammal gelatines, (see also under 24:)
    - Gelatines made from tanners refuse and from sinews.
    - Gelatines made from feet and hoofs.
    - Gelatines made from bone and ivory shavings.
  - *b.* Bird gelatines:
    - (Nests of esculent swallows, (*Calocalia esculenta*, *C. fuciphaga*, *C. indifica*, &c.,) exported from Indian Archipelago to China.)
  - *c.* Fish gelatines or isinglass, (see also under 24.)
  - *d.* Insect gelatine:
    - Gelatine from cocoons of silk-worms.

5. BAITS AND FOODS FOR ANIMALS.
  - *a.* Prepared baits, (see under B, 45.)
  - *b.* Food for domesticated animals:
    - Oil-factory scraps.
    - Fish-scraps.
    - Cuttle-fish bone, (see under 18.)

II. CLOTHING.

6. FURS, (embracing the furs in their rough state, (*peltries*,) and in the various stages of preparation; also the manufactured articles, such as robes, rugs, cloaks, sacks, tippets, cuffs, muffs, hats, caps, gloves, trimmings and linings.)[1]
  - *a.* Mammal furs:
    - (Diana monkey, (*Cercopithecus diana*,) of West Africa.)
    - (Black monkey, (*Colobus polycomus*, and other species,) of West Africa—trimmings, &c.)
    - (Abyssinian monkey, (*Colobus guereza*.))

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[1] *Note.*—For convenience in arranging the general collections of the museum, this list has been made unusually full, and includes all furs known to be found in American and European markets.

6. FURS—Continued.

a. Mammal furs:

(American howling-monkey, (*Mycetes*, several species)—muffs.)
(Lion, (*Felis leo*,) of Africa and Asia—rugs.)
(Tiger, (*Felis tigris*)—rugs, &c.)
(Leopard, (*Felis pardus*)—rugs and saddle-cloths.)
Puma, (*Felis concolor*)—carriage-robes, rugs, &c.
Ocelot, (*Felis pardalis*)—rugs.
Jaguar, (*Felis onca*)—rugs.
Cat, (*Felis domestica*)—robes and philosophical apparatus.
  Black cat.
  White cat.
  Maltese cat.
  Tortoise-shell.
(Wild-cat, (*Felis catus*,) of Europe and Asia—robes and linings.)
(Snow leopard, (*Felis irbis*,) of Asia.)
Eyra, (*Felis eyra*.)
Yaguarundi, (*Felis yaguarundi*.)
(Cheetah, (*Cynailurus jubatus*,) of India and Southern Asia.)
Bay lynx, (*Lynx rufus*)—rugs, and, when dyed, muffs and boas.
Canada lynx, (*Lynx canadensis*)—rugs and trimmings, and dyed muffs, boas, &c.
Dog, (*Canis familiaris*.)
Eskimo dog.
Wolf, (*Canis lupus*)—linings, rugs, and robes.
  White wolf.
  Black wolf.
  Gray wolf.
  "Blue wolf."
  Red wolf.
Coyote, or prairie wolf, (*Canis latrans*)—rugs and robes.
(Jackal, (*Canis aureus*,) of Old World.)
Red fox, (*Vulpes alopex*, var. *fulvus*)—robes, (mostly imported to Turkey.)
Cross fox, (*Vulpes alopex*, var. *decussatus*)—robes, trimmings.
Black and silver fox, (*Vulpes alopex*, var. *argentatus*)—muffs, cloaks, trimmings; also, fox-skins dyed to imitate lynx; also, various imitations of silver-fox, made from skins of more common varieties.

6. FURS—Continued.

a. Mammal furs:

- Arctic fox, (*Vulpes lagopus.*)
    - White fox.
    - Blue fox.
- Kit fox, (*Vulpes velox*)—robes, muffs, trimmings.
- (Cossac fox, (*Vulpes corsac,*) of Asia.)
- (Mountain fox, (*Vulpes montanus,*) of India.)
- Gray fox, (*Urocyon virginianus*)—rugs, robes, and linings.
- (Spotted hyena, (*Hyæna crocuta,*) of West and South Africa.)
- (Striped hyena, (*Hyæna striata,*) of West Africa and India.)
- Fisher or pekan, (*Mustela Pennanti*)—linings, tails used for trimmings.
- American or Hudson's Bay sable, (*Mustela americana*)—cloaks, muffs, cuffs, boas, linings, &c.:
    - Silver variety.
    - Orange variety.
    - Brown or common variety.
- (Russian sable, (*Mustela zibellina,*) of North Europe and Asia—cloaks, muffs, boas, linings, &c.)
- (Tartar sable, or kolinsky, (*Mustela sibirica*)—cloaks, muffs, and dyed to imitate Russian sable.)
- (Pine marten, (*Mustela abietum,*) of North Europe and Asia.)
- (Stone marten, or French sable, (*Mustela saxorum,*) of Europe—dyed to imitate sable.)
- (Beech marten, (*Mustela foina,*) of Europe and Asia—dyed to imitate sable.)
- (Polecat, fitch, or ferret, (*Putorius vulgaris,*) of Europe and Asia.)
- Ermine, or weasel, (*Putorius erminea,*) of Northern Hemisphere—cloaks, linings, &c.:
    - Royal ermine, trimmed with astrakhan fur, (miniver.)
    - Siberian ermine.
- Long-tailed weasel, (*Putorius longicauda :*)
    - Summer dress.
    - Winter dress.
- Mink, (*Putorius vison,*)—cloaks, muffs.
- Wolverine, (*Gulo luscus,*)—muffs, robes, linings.
- American badger, (*Taxidea americana*)—muffs and rugs.

6. FURS—Continued.

a. Mammal furs:

(European badger, (*Meles vulgaris*)—muffs and rugs.)

Skunk, Alaska sable, (*Mephitis mephitica*)—muffs, boas, &c.

White-backed skunk, (*Conepatus mapurito.*)

Striped skunk, (*Spilogale putorius.*)

Otter, (*Lutra canadensis,*) with specimens of the plucked and dyed fur—muffs, trimmings, &c.

Sea otter, (*Enhydra marina*)—muffs, gloves, collars, cuffs, trimmings.

Black bear, (*Ursus americanus*)—caps, rugs, muffs, robes, &c.

- *a′.* Cinnamon variety.
- *b.* Silvery variety.

(Brown bear, (*Ursus arctos,*) of Europe and Asia.)

Grizzly bear, (*Ursus horribilis*)—rugs, robes, trimmings.

White bear, (*Thalarctos maritimus*)—rugs, robes, and used extensively by the Eskimos.

Raccoon, (*Procyon lotor*)—hats, linings.

Fur-seal, (*Callorhinus ursinus*)—cloaks, hats, gloves, muffs, linings, trimmings, &c.

Cub fur.

(Antarctic fur-seal, (*Arctocephalus aucklandicus*, &c.)

Hair seal, (*Phoca vitulina* and *Phoca Richardsii*)—coats, caps, linings for shoes.

Harp seal, (*Pagophilus grœnlandicus,*) with specimens of the white fur of the unborn cub, and the blue fur of the young.

Hood seal, or bladder-nose, (*Cystophora cristata.*)

Square flipper, or bearded seal, (*Erignathus barbatus,*) with specimens of fur dyed to imitate leopard.

Banded seal, (*Histriophoca equestris*)—used by Eskimos as fur.

Gray seal, (*Pusa gryphus.*)

Ringed seal, (*Pagomys fœtidus.*)

Bison, or buffalo, (*Bison americanus*)—rugs and robes.

- *a′.* Mountain bison.
- *b.* Common bison.

Musk-ox, (*Ovibos moschatus*)—robes, rugs, and trimmings.

(Yak, (*Poëphagus grunniens,*) of Asia—robes and trimmings.)

Mountain goat, (*Aplocerus montanus*)—robes, &c.

6. FURS—Continued.

a. Mammal furs:

(Llama, guanaco, paco, and vicugna, (*Auchenia*, sp.)—trimmings, &c.)

Goat, (*Capra*, sp.)—rugs, trimmings.

- *a'*. Angora goat.
- *b.* Cashmere goat.
- *c.* Other varieties.

Sheep, (*Ovis aries*)—rugs, trimmings, &c.

- *a.* Astrakhan sheep.
- *b.* Caracoul sheep.
- *c.* Other varieties. Lamb-skins and dyed furs.

Antelope, (*Antilocapra americana*)—rugs.

Moose, (*Alces malchis*)—rugs and robes.

Elk, (*Cervus canadensis*)—rugs and robes.

Reindeer, (*Tarandus rangifer*)—robes, coats, gloves, &c.

Caribou, (*Tarandus rangifer* var.)—robes, coats, gloves.

Mule deer, (*Cariacus macrotis*)—trimmings, robes.

Virginia deer (*Cariacus virginianus*)—trimmings, robes.

Mole, (*Scalops* and *Condylura*, sp.)—robes, garments.

(European mole, (*Talpa europæa*)—robes, garments.)

Woodchuck, or siffleur, (*Arctomys monax*)—robes, exported to Europe as "white and gray weenusk."

Marmot, (*Arctomys caligatus*)—robes, trimmings.

Parry's marmot, (*Spermophilus Parryi*)—robes, trimmings.

Gray squirrel, (*Sciurus carolinensis*, &c.)—trimming; tails used for boas.

(Squirrel, or "calabar," (*Sciurus vulgaris*,) Northern Europe and Asia.)

- *a'*. Siberian squirrel. Trimmings, muffs, capes, &c.; tails used for boas, dyed to imitate sable.
- *b.* "Weisenfels linings" of the white fur of the belly.

Showt'l, (*Haplodontia leporina*)—used by Indians.

(Chinchilla, (*Chinchilla laniger*,) of South America—muffs, mantles, boas, cloak-linings, and trimmings.)

Musquash, (*Fiber zibethicus*)—muffs, capes, caps, and linings, and imitations of beaver-fur.

(Neutria, or Coypu, (*Myopotamus coypus*)—linings and muffs, and imitations of beaver.)

6. FURS—Continued.
  a. Mammal furs:
    (Beaver, (*Castor fiber*,) of Northern Europe and Asia.)
    Beaver, (*Castor canadensis*)—linings and muffs.
      White beaver.
      Spotted beaver.
    Rats and mice, (*Mus.*, sp. var.)
    Lemming, (*Myodes torquatus* and *obensis*)—robes.
    Rabbit, or cony, (*Lepus cuniculus*)—children's furs, and imitations of seal, beaver, &c., exported largely to China.
        White variety.
        Blue variety.
        Brown variety.
    American native rabbit furs, such as *Lepus glacialis*, used for muffs, boas, and feltings.
    Possum, (*Didelphys virginiana.*)
    (Kangaroo, (*Macropus giganteus*,) of Australia.)
    (Ornithorhynchus, (*Ornithorhynchus anatinus*,) of Australia.)
  b. Skins of birds used as furs:
    Turkey furs, (*Melagris gallopavo*, &c.)
    Gull furs, (*Larus argentatus*, &c.)
    Grebe furs, (*Podiceps aristatus*, &c.)
    Loon furs, (*Colymbus torquatus*, &c.)
    Swan furs and swan's down trimmings, (*Cygnus americanus*, &c.)
    Pelican furs, (*Pelecanus fuscus*, &c.)
    Adjutant crane, (*Ciconia argala*)—feathers used as fur.
    Puffin furs, (*Fratercula arctica*, &c.)
    Penguin furs, (*Aptenodytes*, *Pennantii*, &c.)
    Feathers of common fowl used in trimmings.
7. LEATHERS. (See under 20.)
8. TEXTILE FABRICS.
  a. Prepared from hair of mammals:
    Human hair used in manufacture of watch-chains.
    Hair of bats used in felting and in plaiting ropes in Central America and tassels in New Caledonia.
    Hair of raccoon used in felting, (largely exported to Germany for the use of hatters.)
    Hair of weasels and sables used in felting.

8. TEXTILE FABRICS—Continued.

a. Preparations of hair of mammals:

Hair of fur seal woven with silk in the manufacture of shawls.

Moose hair and its fabrics.

Ox and calf hair used in the manufacture of imitation woolen goods.

Sheep's wool, with specimens of fleeces and stapled wools, from various breeds and localities, short-wool fabrics, broadcloths, merinoes, flannels, mouselins de laine, serges, tweeds, blankets, carpets, and tartans, worsted fabrics, stuffs, bombazines, camlets, shawls, plushes and velvets, hosiery, and yarns, felts, felt-cloths, and felt-hats.

Goats' wool with specimens of mohairs, cashmeres, plushes, velveteens, camlets, and shawls. (For manufactured wigs and perukes, see under 21.)

(Yak (*Poëphagus grunniens*) wool with specimens of yak-lace and other fabrics.)

(Camels' hair with specimens of fabrics, plushes, felts, shawls, &c.)

(Hair of llama, paco, guanaco, and vicugna, with specimens of alpaca, guanaco, and other fabrics, and umbrellas and other articles manufactured.)

Hair of horses used in weaving furniture-covers, crinoline-skirts, and bags for pressing oil.

Hair of buffalo used in plaiting ropes, lariats, &c.

Fur of mole used in felting.

Beaver (castor) fur with specimens of the felt cloths, hats, &c.

(Neutria-fur used in felting and in the manufacture of hats.)

Musquash fur used in felting.

Possum hair with fabrics of Indian and other manufacture.

Fur of rabbit and hare used in felting, with specimens of hats and cloths.

Whalebone fiber used in weaving cloth covers for telescopes, &c.

b. Prepared from feathers of birds:

Cloths woven from feathers, (China.)

c. Prepared from silk of insects: (This collection should include specimens of the cocoons, the raw silk, the spun silk, and of the various fabrics, plain and figured silks, satins and satinettes, shawls, damasks, brocades, crapes, and ribbons.)

8. TEXTILE FABRICS—Continued.

c. Prepared from silk of insects:

Silk of common silk-worm, (*Bombyx mori.*)

Silk of *Samia cecropia*, *Samia polyphemus*, and other native American moths.

(Silk of exotic moths other than *Bombyx mori*, such as the tussah, (*Bombyx pernyi* and *Bombyx mylitta*,) the moonga, (*Saturnia assamensis*,) the joree, (*Bombyx religiosa*,) the ena or arindy, (*Bombyx cynthia.*))

Fabrics woven by the insects themselves, as *Tinea padilla.*

Silk of spiders.

d. Prepared from byssus of mollusks.

(Fabrics woven from byssus of the wing-shell (*Pinna nobilis*) and other mollusks.)

III. MATERIALS EMPLOYED IN THE ARTS AND MANUFACTURES.

* *Hard materials.*

9. IVORY AND BONE. (This collection should include specimens of the various ivories and bones in their rough state, and manufactured into buttons, trinkets, cutlery-handles, canes, pen and pencil handles, brush-handles, billiard and bagatelle balls, dice, piano-keys, harness-rings, combs, false-teeth, philosophical instruments, and as used by portrait painters and photographers.)

a. Ivory of mammals:

Tusks of walrus used for trinkets, handles, jewelry, buttons, paper-knives, counters, &c.

Teeth of bears, dogs, wolves, foxes, peccaries, and other large mammals, used as implements, arrow-tips, and ornaments, by Indians.

Elk-ivory used by Indians in ornamentation.

Tusks of mammoth elephant (*Elephas primigenius*) from northern America and Asia, with Eskimo carvings and specimens of "Siberian ivory."

9. IVORY AND BONE—Continued.

a. Ivory of mammals:

(Tusks of African elephant with specimens of sawed and scroll ivory and of the manufactured balls, combs, piano-keys, handles, rings, canes, buttons, trinkets, bangles, and miniature tablets.)

(Tusks of the Asiatic elephant and their applications.)

(Teeth of hippopotamus as used for handles for surgical instruments, index-fingers, and formerly for false-teeth, (trade-name, "sea-horse.")

Teeth of wild-hog used in manufacture of jewelry, vinaigrettes, &c.

Teeth of peccary.

Ivory of narwhal used for canes.

Teeth of sperm-whale and their application to the manufacture of balls, buttons, and trinkets.

Incisors of beaver used by Indians for chisels, knives, and ornaments.

b. Ivory of reptiles:

Teeth of alligator used for jewelry, whistles, cane-handles, buttons, &c.

c. Ivory of fishes:

Sharks' teeth used in arming weapons.

Teeth of sharks and other fish used as trinkets.

Jaws of the sleeper-shark (*Somniosus brevipinna*) used for head-dresses by Indians.

d. Bone of mammals:

Parts of splanchno-skeleton of ferae, used as charms.

Bones of bear and other large mammals, used by Indians for implements, and as tablets for paintings.

Bones of buffalo and of the domestic ruminants, used as substitute for ivory in the manufacture of buttons, handles, combs, &c.

Sperm-whale jaw-bone, used for harness-rings, martingales, &c.

Horn-cores of ruminants, used in manufacture of assayers' cupels.

e. Bone of birds:

Bones of birds, used by Indians and Eskimos in making awls, needles, flutes, bird-calls, and dress-trimmings.

9. IVORY AND BONE—Continued.

f. Bone of fishes:

Fish-bones, used by Indians and Eskimo in making implements.

Shark's vertebræ, used for canes.

Bones of sharks and skates, used (in Japan) in making imitation tortoise-shell.

g. Waste bone and ivory:

Use in manufacture of bone-black, ivory-black, and bank-note ink, (see under 29.)

Use in manufacture of sizes and glues, (see under 24.)

Use in manufacture or gelatine for food, (see under 4.)

Use in manufacture of phosphorus, carbonate of ammonia, (hartshorn,) and sal ammoniac, (see under 30.)

Use in manufacture of bone-charcoal for filters, (see under 30.)

Use in manufacture of paper.

Use of shavings in case-hardening gun-barrels and other fine steel.

10. HORN. (Embracing the varieties of horn known to commerce, the split and pressed horns, and the various manufactured articles, such as jewelry, combs, and handles.

a. Horn, employed as a material:

Horn of rhinoceros, used for handles and trinkets, cups, boxes, whips, and canes.

Horns of ox, sheep, and goat, used for handles, buttons, combs, powder-flasks, cups, boxes, stirrups, spoons, and imitations of tortoise-shell, also " sensitive Chinese leaves," and formerly for transparent plates in lanterns and horn-hooks, for trumpets, and for finger-nails in slay figures.

Horn of buffalo, used like that of ox.

(Horn of Asiatic buffalo, (*Bos bubalus.*))

Horn of mountain-sheep and mountain-goat, used by Aleutians, in making spoons, bowls, and numerous other implements.

b. Antlers:

Antlers of deer, elk, and moose, (stag-horn,) used in the manufacture of handles for instruments, trinkets, and buttons.

10. HORN—Continued.

b. Antlers:

Antlers of deer, elk, moose, and nearly all species of ruminants, employed for ornamental purposes.

c. Chemical and other applications:

Burnt horn, (*cornu ustum*,) used in dentifrices.

Carbonate of ammonia, (hartshorn,) manufactured from deer-horns, (see under 30.)

11. HOOFS AND CLAWS, &c. (Embracing the commercial hoof, and the various stages of manufacture represented by specimens.)

a. Hoofs:

Hoofs of ox and bison, used in making buttons, combs, and handles.

Hoofs of horse, used like those of ox and bison.

Hoofs of musk-ox, deer, and antelope, used by Indians in ornamentation.

Feet of deer, used for knife-handles, stool-feet, &c.

b. Claws:

Claws of bear, puma, wolf, &c., used by Indians in ornamentation.

(Claws of lion and tiger, used by jewelers for trinkets.)

Human nails, used by Indians for ornamental trimmings.

c. Chemical applications of hoofs and claws:

Use in manufacture of prussiate of potash, (see under 30.)

Use in manufacture of glue, (see under 24.)

12. BALEEN. (Embracing the commercial baleen in its various grades, *Greenland*, *Northwest Coast*, *South Sea*, *fin-back*, and *hump-back*, with the split, twisted, and dyed bone.)

a. Whalebone, as used by manufacturers of ribbons, hats, umbrellas, whips, canes, boots, fishing-rods, billiard-tables, buttons, handles, brushes, surgical instruments, stays, corsets, crinolines, harness-rosettes, covers, stuffings, light woven hats and bonnets, &c.; also, imitation whalebone, (wallosin,) made from rattan.

13. TORTOISE-SHELL. (Embracing the carapace entire, and the commercial shell, *blades*, *feet*, *noses*, and *head*.)

13. TORTOISE-SHELL—Continued.

a. Shell of tortoise (*Eretmochelys imbricata, E. squamata*) used in manufacture of combs, handles, jewelry, inlaying, and buttons, together with imitations of tortoise-shell in horn, shark's bone, and celluloid.

b. Shells of land tortoises, used by Indians for pots, scoops, and rattles.

14. SCALES.

a. Shell of mammals:

Shell of armadillo, used by Texans and Mexicans.

b. Scales of fishes used in ornamental work, with specimens of flowers and other articles manufactured:

Scales of paviot fishes, (*Scaridæ* and *Labridæ.*)

Scales of mullets, (*Mugilidæ.*)

Scales of sheepshead, &c., (*Sparidæ.*)

Scales of drum and bass, (*Sciaenidæ.*)

Scales of Serranidæ and perches, (*Percidae* and *Labracidæ.*)

Scales of Lobotidæ.

Scales of tarpum, (*Elopidæ.*)

Scales of herrings, (*Clupeidæ.*)

Scales of Cyprinidæ.

Scales of eels, used in the north of Europe to give a pearly luster in ornamental house-painting.

Scales of gar-pikes, used by Indians for arrow-tips.

(Pearl white, or *essence d'Orient*, prepared from scales of *Alburnus lucidus* and other Cyprinidæ and Clupeidæ, used in making artificial pearls.) (See under 27.)

Shagreen of trigger-fish, (*Balistes*,) used in polishing wood.

Shagreen of sharks, used as leather, (see under II, B. 5,) and for polishing purposes, particularly in the manufacture of quill pens.

Scales of sturgeons, used by Indians for implements.

For gelatine as a material and the arts and papier glacé, see 24.

15. PEARL.

a. Pearls and nacre, (embracing the pearl-yielding shells, with the pearls and the mother-o'-pearl in the rough state, with the manufactured buttons, handles, and jewelry, pearl-powder, inlaid work, and papier maché, ornamented with mother-o'-pearl:)

15. PEARL—Continued.

a. Pearls and macre:

Top-shells, (*Turbinidæ*,) and their application to manufacture of shell-flowers.

Tower-shells, (*Trochidæ.*)

Ear-shells, (*Haliotidæ*,) used in manufacture of buttons, handles, inlaid work, and pearl-powder.

Other gastropods supplying nacre.

Pearl-oysters, (*Aviculidæ*,) with pearls and nacre.

River-mussels, (*Unionidæ*,) with pearls and nacre.

Mussels, oysters, and other conchifers supplying pearls and nacre.

Shells of nautilus and argonaut, prepared to exhibit their nacre.

Ornamental pearl-work, imitating sprays of flowers, &c.

Imitation pearls.

16. SHELL.

a. Cameo shell:

Shell of conch, (*Strombus gigas*,) and carvings.

Shell of helmet, (*Cassis rufa*, *C. tuberosa*, and *C. madagascariensis*,) with carvings.

b. Shells used for implements, &c.:

Shells of *Strombus*, *Triton*, *Dolium*, *Fusus*, *Murex*, and *Buccinum*, used for fog-horns, lamps, vases, and ornamental borders in flower-gardens.

Shells of *Busycon*, *Sycotypus*, *Mactra*, &c., used by Indians in manufacture of implements, with specimens of implements.

Shells of *Mactra*, used for ladles, scoops, and spoons by fishermen.

Shells of *Tridacna*, used for vases, fountains, and in the manufacture of handles and carvings.

Shells of *Pecten*, *Haliotis*, *Dentalium*, *Mercenaria*, &c., used by Indians for trimmings and ornaments.

(Scallop, or palmer's shell, (*Pecten jacobæus*,) used as a decoration of honor.)

(Chank shell, (*Turbinella pyrum*,) used in the manufacture of Hindoo bangles, and in polishing cloth.)

Shells of *Pecten*, used in making pin-cushions and purses.

16. SHELL—Continued.

b. Shells used for implements, &c.:

(Painters' mussel, (*Unio pictorum*,) used to hold colors.)

(Shells of *Placuna placenta*, used in China as a substitute for window-glass.)

Shells of *Mercenaria violacea*, *Purpura lapillus*, and *Buccinum undatum*, used by Indians of eastern coast in manufacture of money, with specimens of wampum, (with the modern wampum or shell-beads manufactured for the Indian trade,) and of the hyqua or *Dentalium* shells, employed in a similar manner by the Indians of the Pacific coast.

Specimens of the cowry, (*Cypraea moneta.*) "Live cowry" and dead cowry, used in African trade and for trimmings.

Shells of *Cypraea*, *Rotella*, *Oliva*, *Turritella*, *Phasianella*, (Venetian shells,) &c., mounted as buttons and jewelry.

Composition shell-work for box-covers and frames, made by glueing shells in mosaics.

Calcined shells, used by dentifrice and porcelain makers. (See, also, under 32.)

Cuttle-fish bone from *Sepia officinalis*, used as a pounce, as a dentifrice, as polishing-powders, for taking fine impressions in counterfeiting, and as food for birds. (See, also, under D. 5.)

Concretions from the stomach of *Astacus*, known as "crab's-eyes" and "crab-stones," and used as antacids.

Shell of king-crab, (*Limulus polyphemus*,) used as a boat-bailer.

Opercula of mollusks, used as "eye-stones."

17. CORAL.

a. Coral as a material:

Red coral, (*Corallium nobilis*,) with specimens of the five commercial grades (1, froth of blood; 2, flower of blood; 3, 4, 5, blood of first, second, and third qualities) of the white variety, and of the round beads, negligée beads, bracelets, pins, coronets, armlets, and earrings, &c.

White coral, *Oculina*, sp., used by jewelers.

Madrepores and other showy corals, used for ornamental purposes.

Horny axis of black flexible coral, (*Plexaura crassa*,) used for canes and whips in the Bermudas.

17. CORAL—Continued.

a. Coral as a material:

Axis of fan coral, (*Rhipidogorgia*,) used for skimmers and strainers in the Bermudas.

Coral, used for building purposes.

Coral rock of recent formation, (Coquina,) used in Florida in manufacture of ornamental vases and carvings.

Calcined coral, used for dentifrices, as an antacid, &c.

Imitations of red coral in celluloid, rubber, and other substances.

18. INFUSORIAL EARTHS.

a. Polishing powders, (used for polishing metals, cabinet-ware, and stone:)

Specimens of polishing-slate, tripoli, and other foreign polishing-powder.

Specimens of American infusorial deposits.

b. Infusorial earths, employed in manufactures:

Infusorial earth, used in making window and plate glass.

Infusorial earth, used in making soluble glass.

Infusorial earth, used in making mortar.

Infusorial earth, used in making molds for metal casting.

Infusorial earth, used in making filters.

Infusorial earth, used in making dynamite.

Infusorial earth, used in making fire-proof packing.

Infusorial earth, as an absorbent for oils and liquids.

19. OTHER MATERIALS FROM INVERTEBRATES.

a. From insects:

Brazilian diamond-beetles, used in jewelry.

Wings of beetles, used in embroidery.

b. From echinoderms:

Spines of echinoids, used for slate-crayons.

** *Flexible materials.*

20. LEATHERS. (Embracing the hides in a rough state, in the various stages of dressing, and manufactured into shoe-leather, parchment, vellum, binder's leather, thongs, &c.)

a. Prepared from mammal skins:

Cat-leather.

Dog and wolf leather, used for drum-heads, &c.

20. LEATHERS—Continued.

a. Prepared from mammal skins:

Bear-leather.

Raccoon-leather, used for gloves and upper-leathers of shoes.

Seal-leather, used for fine shoes and in the manufacture of "patent leather," and by Eskimos for numerous purposes.

Sea-lion leather, used by Eskimos to cover bidarkas and for garments and beds.

Walrus-leather, used by Eskimos for harness, tables, thongs, seal-nets and for covering polishing wheels.

Bison-leather (and buffalo-leather, buff-leather.)

Ox-leather, with specimens of sole-leather, split-leather, grain-leather, rawhide thongs, whips, leather-belts and saddles, and of calf-skins, prepared for binders' and boot-makers' use, as Russia leather and vellum, and tawed, as parchment.

Sheep-leather, with specimens of binder's leather, imitation chamois leather, wash-leather, buff-leather, roan, imitation morocco and parchment, with vellum made from skins of dead-born lambs, and manufactured gloves, &c.

Goat-leather, with specimens of shagreen-leather, morocco-leather, as used for linings, upholstery, bindings, and pocket-books, parchment, drum-heads, &c., with kid-leather, used in manufacture of shoes and gloves, under-clothing, and vellum made from skin of young kids, also skin-bottles used in Asia.

Horse and ass leather, used in manufacture of shagreen, sole-leather, harness-leather, saddles, trunks, water-hose, pump-valves, military accoutrements, ladies' shoe-uppers.

(Chamois leather, (*Capella rupicapra*,) used for polishing purposes and for straining mercury.)

(Leather of gazelle, (*Gazella dorcas*,) used in packing commercial aloes, and of African antelopes, used in packing elephants' tusks.)

Deer-leather, dressed as buff-leather, chamois-imitation leather, Indian dressed (buckskin,) and for the finer moroccos, also manufactured into gloves, gaiters, undergarments, polishers, &c.

Moose-leather in ordinary and buckskin finish.

20. LEATHERS—Continued.

a. Prepared from mammal skins:

Caribou-leather in ordinary and buckskin finish.

(Reindeer-leather.)

Elk-leather in ordinary and buckskin finish.

Antelope-leather in plain, buckskin, and oil-finish, used in manufacture of castor-gloves.

Peccary-leather as used in the manufacture of gloves.

Hog-leather used by saddlers, shoemakers, and book-binders.

Hippopotamus-leather used for buffing or polishing wheels.

Rhinoceros-hide used for shields, targets, whips, &c.

Beluga leather dressed as kid, sole, harness, velvet, plush, boot, mail-bags, belts, and patent (varnished) leather.

Porpoise-leather.

Beaver-leather used in manufacture of saddles, shoes, gloves, and trunks.

(Nutria-leather (*Myopotamus coypus*) of South America.)

Rat-leather used for thumbs of kid gloves.

(Kangaroo-leather.)

Leather trimmings used as stuffing for balls, &c.

b. Prepared from intestines of mammals:

Parchment from viscera of seals, used by Eskimo for clothing, bags, and blankets.

Leather from pharynx of seal and walrus used by Eskimo for boot-soles.

Parchment from viscera of bears used in Kamtchatka for masks and window-panes.

Viscera of ox used in manufacture of gold-beaters' skin.

Bladders of animals used for pouches, parchment, bottle and jar covers, and by Eskimo for oil-bottles.

Viscera of sheep used in manufacture of "cat-gut," with specimens of whip-cord, hatters' cord, for bowstrings, clock-makers' cord, filandre, guitar, violin, and harp strings, angling-lines, &c.

Viscera of hog used as envelopes for minced meat, sausages, &c.

Sinews of sheep, dear, goat, buffalo, seal, walrus, and other animals used in manufactures of threads, lines, nets, and snow-shoes, in strengthening bows, &c., the Babiche of the Eskimos of the northwest coast.

20. LEATHERS—Continued.

- *c.* Prepared from bird-skins: (Eskimos.)
  - Eider-leather.
  - Auk-leather.
  - (Ostrich-leather used by Arabians.)
- *d.* Prepared from reptile skins:
  - Alligator-leather.
  - Rattlesnake-leather.
  - Other snake-leather.
- *e.* Prepared from fish-skins:
  - Leather prepared from scaled fish by Indians.
  - Eel-leather, (pigtails, queues, flail-thongs.)
  - Shark-leather, (shagreen used for coverings and by the Alaska Indians for boot-soles.)
  - Sturgeon-leather.
  - (Skins of *Diodon* used in making helmets.)
  - Stomach membranes of halibut used in Greenland for window-transparencies.
- *f.* Leather waste:
  - Paper manufactured from waste.
  - Glue manufactured from waste, (see under 24.)
  - Prussian blue made from leather waste, (see under 30.)

21. HAIR AND WOOL.

- *a.* Hair used in weaving and felting, (see under 8.)
- *b.* Hair used for wigs and ornament:
  - Human hair as an article of commerce, with specimens of switches and wigs, and also of the trade imitations of hair in jute, horse-hair, &c.
  - Goats' wool as employed in manufacture of wigs and perukes.
  - Horse-hair employed for military accoutrements and for standards, (Turkey.)
  - Human scalp-locks as Indian trophies.
  - Scalps of animals as trophies.
- *c.* Hair and bristles used for brushes, (embracing the commercial hair and bristles, assorted and unassorted, and specimens of the manufactured articles:)
  - Hair of skunk used for fine brushes.
  - Hair of bear used for varnishing-brushes.

21. HAIR AND WOOL—Continued.

c. Hair and bristles used for brushes:

Hair of American badger used for fine shaving, graining, gilding, and dust brushes.

(Hair of European badger used for coarse brushes.)

Hair of dog used for coarse pencil-brushes.

Hair of squirrel, marten, sable, kolinsky, and weasel, especially the tails, used in making fine artists' pencils.

(Hair of camel used for pencils.)

Bristles of hog and peccary used in making coarse brushes for varnishing, scrubbing, &c.

Tails of horses, buffaloes, &c., used for fly-brushes.

(Tails of yak used for fly-brushes.)

(Tails of elephants used for brushes and standards.)

Sheep's wool (on skin) used for black-board rubbers.

Hair of deer and antelope (on skin) used by Indians for hair-brushes.

Ox-hair from the inside of cows' ears used for striping and lettering brushes.

d. Hair used in other manufactures:

Bristles used in shoemakers' waxed ends.

Bristles used in anatomical instruments.

Hair and bristles used in artificial flies. (See under B, 45.)

Hair of cattle used in strengthening mortar and plaster.

e. Hair used for stuffing:

Horse-hair, straight and curled, used for mattresses and cushions.

Refuse hair of beaver and musquash, cut from felting-hair, used for cushions.

(Down of rabbits used for cushions.)

f. Wool used as a medium for pigments:

Wool flocking used in the manufacture of wall-paper, colored felts, and rubber-cloth.

g. Chemical products:

Refuse human and other hair used in manufacture of prussiate of potash, with specimens of manufactured product.

22. QUILLS.

a. Quills of mammals:

Quills of American hedge-hog used by Indians in embroidering.

22. QUILLS—Continued.

a. Quills of mammals:

(Quills of porcupine used for pen-holders, floats for fishing, eyelet-punches, &c.)

(Quills of European hedge-hog, on skin, used as a muzzle for weaning calves.)

b. Quills of birds:

Quills of swan and turkey for engrossing-pens.

Quills of goose and eagle for writing-pens.

Quills of crow and duck for fine pens.

Quills used in making toothpicks, fishing-floats, color-bottles, pencil-handles, needle-holders, &c.

23. FEATHERS.

a. Feathers used for clothing. (See under Furs, D 6.)

b. Feathers used for implements, (including manufactured articles:)

Feathers of hawks used as fans and screens.

Feathers of fowl, turkey, grouse, and peacock used for brushes, fans, and screens.

Feathers of ibis, spoonbill, egret, and bittern used for fans and screens.

Feathers of flamingoes, swans, geese, and ducks used for fans and screens.

c. Feathers used for plumes and ornament, (including plumes, head-dresses, cockades, hat and dress trimming, &c.:)

Feathers and wings of small perchers used in millinery and in manufacture of feather flowers.

Feathers of trogons and birds of paradise used as plumes and for feather flowers.

Feathers of humming-birds, scalps, and throats used in ornamental work.

Feathers of kingfishers used in plumagery.

(Feathers of parrots used in making feather flowers.)

Eagle and hawk feathers used for plumes.

Feathers of pigeons used for ornamental work.

Feathers and wings of cock used as plumes, trimmings, &c., natural and dyed.

Breast feathers of grouse, pheasants, and turkeys used as roll-plumes in hats.

23. FEATHERS—Continued.

c. Feathers used for plumes, &c.:

Feathers of ibises, spoonbills, flamingoes, herons, egrets, and bitterns used for plumes and ornamental work.

(Feathers of adjutant, (*Lepoptilus argala*,) and marabou, (*Lepoptilus marabou*,) used for plumes and trimmings.)

Feathers of flamingoes, swans, geese, and ducks used in ornamental work for roll-plumes, and swans' down for trimmings. (See under 6.)

Breast-feathers of gulls, terns, and tropic birds used as roll-plumes.

(Feathers of African ostrich used for plumes and trimmings, with specimens of undressed, scoured, bleached, scraped, and dyed grades.)

Feathers of American ostrich.

Specimens of composite feather flowers.

Specimens of plumagery work on metal.

Specimens of birds mounted for use in millinery.

d. Feathers used in other manufactures:

Feathered arrow-shafts. (See under B, 18.)

Feathers used in making artificial flies. (See under B, 45.)

Feathers used in manufacture of textile fabrics. (See under D, II, C.)

e. Down of birds:

Down of eider-duck used in bed-stuffing, with specimens of the balls in which it is packed for transportation.

Down of other ducks.

Down of geese and swans used as stuffing for beds, and as electrical non-conductor in manufacture of philosophical instruments.

24. GELATINE AND ISINGLASS.

a. Gelatine:

Gelatine made from leather-shavings, bones, hoofs, and horns of bison, cattle, sheep, and other domestic animals, used in manufacture of glue, size, court-plaster, *papier glacé* for tracing, imitation glass, artificial flowers, and ornamental work, wrappings for confections, table-jelly, (see under D. 1,) &c.

Size and gelatine from fine ivory chips.

24. GELATINE AND ISINGLASS—Continued.

a. Gelatine:

Bone-glue, (Osteocolla.)

(Glue made in India from skin of the ass, (Hippocolla.))

b. Isinglass:

Isinglass, (Ichthyocolla,) made from air-bladders and skins of fishes and used in the manufacture of fine glues and sizes, adhesive and court plasters, diamond cement, imitation glass, and table-jelly and confectionery, (see under D. 1, D,) in refining wines and liquors, in adulterating milk, in fixing the luster of artificial pearls, and in lustering silk ribbons, (embracing the dried bladders and the manufactured products,) in their grades of "lyre," "heart-shaped," "leaf," and "book" isinglass.

Isinglass from sounds of cod and hake.

Isinglass from the squeteague family, (*Sciænidae*,) principally used by confectioners.

Isinglass from cat-fish family, (*Siluridae.*)

Isinglass from carp family, (*Cyprinidae.*)

Isinglass from sturgeons in all its grades and commercial forms.

Isinglass prepared from fish-skins.

25. FLEXIBLE MATERIALS DERIVED FROM INVERTEBRATES.

a. Insect productions:

Silk-worm "gut" used in making leaders for fish-lines.

(Nest of Cayenne-ant, (*Formica bispinosa*,) used as a mechanical styptic.)

Spiders' web used as a mechanical styptic and for the cross-lines in optical instruments, (see, also, under D, 8.)

Papier-maché of hornets' nests used for gun-wadding.

b. Mollusk productions:

Byssus of mollusks, (see under D, 8.)

26. SPONGES.

a. Specimens of American commercial sponges, with the different grades, and bleached sponges:

(Specimens of Mediterranean sponges.)

Surgical apparatus, probangs, aurilaves, "sponge-tents," and other instruments manufactured.

Spongeo-piline used as a substitute for poultices.

Sponges used in stuffing mattresses and cushions.

27. OILS AND FATS.

a. Mammal oils :

Bear-oil and bear-fat used as a cosmetic and in the manufacture of pomatums.

Dog-oil used in the manufacture of kid-gloves.

Seal-oil, in its various grades, used for lubricating.

Sea-elephant oil.

Sea-lion oil.

Manatee-oil.

Dugong-oil.

Oil and fat from domestic animals, tallow, suet, lard, lard-oil used in lamps, for lubricating, and neats-foot oil used in dressing leather, also manufactured into various substances, (see D, 30,) and tallow candles and night-lights.

Oil from body of whales, grampuses, and porpoises used in the arts, for lubricating, painting, &c.

Black-fish and porpoise-jaw oil used in lubricating fine machinery, watches, clocks, and guns, with specimens of blubber.

Grampus-oil used for lubricating fine machinery.

Sperm-oil used in lamps, for lubricating, as an emollient in medicine, for lip-salves, and in the manufacture of spermaceti.

Manufactured glycerines, used as a preservative and antiseptic, as a cosmetic, as an emollient, as a substitute for cod-liver oil, in the manufacture of perfumes and hair-dressings, in photography, in the manufacture of nitroglycerine, dynamite, dualine, lithofracteur, coloniamite, and other explosives, soap, &c.

Manufactured stearines, with candles and other manufactured articles.

Soaps manufactured from mammal-oil, soda-soaps, (hard, toilet, and resin soaps,) potash-soaps, (washing, shaving, and soft soaps,) diachylon plaster, &c.

Spermaceti, with specimens of candles.

Butter made from milk of cows, goats, and horses.

Oleomargarines, with specimens of imitation butter.

Brains of buffalo used in tanning by Indians.

b. Bird-oils :

(Oils of petrels and other sea-birds used by Eskimos and in the Azores for lamp-oil.)

27. OILS AND FATS—Continued.

b. Bird-oils:

Goose-oil used by watch-makers, and as an emollient.

(Oil of guacharo, (*Steatornis caripensis*,) used in South America as food.)

(Ostrich used for food, and by the Arabs in medicine, and emu-oil used in Australia in medicine.)

(Oil of penguin, (*Diomedea chilensis*,) of Falkland Islands, sold in London for currying leather.)

(Peacock's fat and oil.)

(Oil of mutton-bird, (*Procellaria obscura*,) of Bass's Straits, used for lamp-oil illuminating.)

(Oil of frigate-bird, (*Tachypetes aquila*,) sometimes used in medicine.)

Oil of pigeon, (*Ectopistes migratorius*,) used as food by Indians and frontiersmen.

(Fulmar-oil from island of Saint Kilda.)

c. Reptile oils:

Alligator-oil manufactured in Florida.

(Alligator-oil used by South American Indians, mixed with chica pigment for painting their bodies.)

Turtle-oil made from turtle-eggs, used in dressing leather and in manufacture of soap.

Rattlesnake and other snake oils.

d. Fish-oils:

Sun-fish oil used by fishermen for cure of rheumatism.

Cod-oil, also cod-liver oil used in medicine, as a food and emollient, and in lubricating.

Hake and haddock liver oil used in adulterating cod-liver oil.

(Pollock-oil used by Shetlanders for illumination.)

Menhaden-oil used in currying leather, in rope making, for lubricating, for adulterating linseed-oil, as a paint-oil, and exported to Europe for use in the manufacture of soap and for smearing sheep.

Herring-oil.[1]

White-fish oil.[1]

Sturgeon-oil.[1]

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[1] NOTE.—These oils, with other oils made from fishes, and a large part of the seal and "black" whale oil, are known indiscriminately as fish-oil and used chiefly for the purposes enumerated under the head of menhaden-oil.)

27. OILS AND FATS—Continued.

d. Fish-oils:

Oulachan oil used by Indians of Northwest coast for food and illumination.

Shark and skate liver oil, including the "Rouen oil," made on the coast of Normandy from the livers of *Raia aquila*, *R. pastinaca*, and *R. batis*, used like cod-liver oil.

Cramp-fish oil used by fishermen for cure of rheumatism.

Soaps made from fish-oil.

28. PERFUMES.

a. Mammal perfumes:

(Civet of the civet-cat (*Viverra civetta*) of Africa.)

(Civet of the rasse (*Viverra rasse*) of Java.)

(Zibeth civet of the Zibeth (*Viverra zibetha*) of Indian Archipelago.)

(Musk from musk-deer, (*Tragulus*, sp. var.,) in its various grades, of Tonquin or Thibet, and Kabardin, Russian, or Siberian musk.)

Musk of musk-ox.

Musk of the musquash.

Castoreum of the beaver, including the various commercial grades, the Canadian, Hudson's Bay, and Russian castoreum, and specimens of castorine.

(Hyraceum of the daman, (*Hyrax capensis.*))

Ambergris of sperm-whale, with specimens of ambreine.

b. Reptile perfumes:

Musk of alligator.

Oil of hawksbill and loggerhead turtles, used in perfumery.

29. COLORING MATERIALS.

a. Derived from mammals:

Bone-black.

Ivory-black, (*noire d'ivoire*,) used in fine painting, and in the manufacture of bank-note ink.

Prussiates, prussian-blue, ferrocyanide of potassium, made from hoofs and refuse human and other hair.

Gall of animals used in dyeing.

Dung of animals used in calico-printing.

Hæmatin made from blood, and used in turkey-red dye-works, and for the red liquor of printers.

Wool-flocking. (See under D, 21.)

29. COLORING MATERIALS—Continued.

b. Derived from birds:

Shell of eggs, used for white pigment.

Series of murexides, or purpurate of ammonia dyes, made from guano.

c. Derived from fishes:

(*Essence d'Orient*, or fish-scale pearl, used as a pigment.)

(Gall of carp, used in Turkey as a green paint and in staining paper.)

d. Derived from insects:

(Cochineal dye, from *Coccus cacti* of Mexico, used in manufacture of rouge, of carmine, and lake pigments, and in coloring tinctures.)

Canadian cochineal.

(Kermes and other cochineals of commerce, *Coccus ilicis.*)

(Lac dye and lac lake, from *Coccus lacca*, *C. polonicus*, *C. uva ursi*, and *Ophis fabæ.*)

Dye prepared from bed-bug, (*Cimex lectularius.*)

(Dye prepared from *Trombidium*, in Guinea and Surinam.)

Nut-galls produced by insects, and used in tanning, for black dyes, for woolen cloth, silk, and calico, and in manufacture of ink and gallic and pyrogallic acid, employed in photography.

e. Derived from mollusks:

(*Sepia* from *Sepia officinalis.*)

Purple dyes from gastropods, *Murex*, *Purpura*, &c.

Purple dyes from nudibranch mollusks.

30. CHEMICAL PRODUCTS AND AGENTS EMPLOYED IN ARTS AND MEDICINE.

a. Derived from mammals:

Secretion of skunk.

Album græcum of dogs, used as a depilatory in tanning hides.

Albumen of blood, employed in sugar-refineries, in certain cements and pigments, and as antidote and emollient.

Dung, used in calico-printing.

Gall of animals, used in mixing colors, in fixing the lines of crayon and pencil drawings, in preparing the surface of ivory for painting, in removing grease, and in medicine.

Pepsine and pancreatine, prepared from stomachs of hogs and calves.

30. CHEMICAL PRODUCTS, &c.—Continued.

a. Derived from mammals:

(Koumiss, a fermented liquor, prepared from mare's and cow's milk, and employed in medicine.)

Phosphorus, prepared from bones, with specimens of matches, vermin poisons, and other products.

Vaccine lymph, derived from cows.

Ammonia, prepared from bones and horn.

Sal ammoniac, prepared from bones and dung.

Prussiates, prepared from hoof, horn, and leather waste, dried blood, hair, and wool, with specimens of blue cyanide of potassium.

Lime from bones and bone phosphates. See also under 32.

Punk and tinder, made from droppings of camel and bison.

Animal charcoal, used as a decolorizer.

b. Derived from birds:

Albumen of eggs, used in photography, in clarifying liquors, by physicians as emollients and antidotes, and by apothecaries in suspending oils and other liquids in water.

Egg-shells, employed as an antacid.

c. Derived from reptiles:

Crotalin of rattlesnake and copperhead.

(*Scincus officinalis* of Egypt, used by European practitioners as sudorific and stimulant.)

d. Derived from fishes:

Propylamine, made from fish-brine.

(Intestines of grayling, used by Laplanders as a substitute for rennet.)

Skins of eels, used by negroes for rheumatism.

e. Derived from insects:

Vesicatory preparations from American beetles, *Cantharis cinerea* and *C. vittata.*

(Vesicatory preparations derived from foreign beetles, cantharides or Spanish flies, (*Cantharis vesicatoria*,) and other species, and substitutes *Mylabris cichorii*, *Cercoma Schoefferi*, *Meloe*, sp. var., &c.)

Vesicatory preparations from American spiders, such as *Tegenaria medicinalis.*

Gall-nuts, used in medicine. (See under 29.)

30. CHEMICAL PRODUCTS, &c.—Continued.

e. Derived from insects:

Coccinella, used as a remedy for toothache.

(Trehala, made from nests of beetles, (*Larinas nidificans*,) of East Indies, and used as a substitute for tapioca.)

Formic acid.

Carbazotic acid and its derivatives, made from sewing silk scraps, and used as a substitute for quinine.

Beeswax, used in manufacture of candles, cerates, plasters, and artificial flowers, in modeling and casting, and in medicine.

Honey, used as a preservative, a food, and in medicine as an aperient and demulcent.

(Wax, used in Chinese pharmacy, secreted by the *Coccus pehlah.*)

(Manna, produced by punctures of *Coccus manniparus.*

a′. Manna from the *Tamarix mannifera*, used as food, and in medicine as a purgative.

b. Cedar manna of Mount Lebanon, from *Pinus cedrus.*

c. Arabian manna, from *Hedysarum alliagi.*)

(Eye-powder, made by Chinese from the Telini fly, (*Mylabris cichorii*,) of India.)

f. Derived from crustacea:

Salve-bug of fishermen of Banks, (*Caligus curtus*,) parasite on cod-fish.

Crabs' eyes, or concretions from stomach of astacus, used as an antacid.

g. Derived from worms:

American leech, (*Macrobdella decora*,) used in surgery.

(European leech, (*Hirudo medicinalis*,) introduced into America.)

(African leech, (*Hirudo trochina*,) introduced.)

Leeches used as barometers.

h. Derived from mollusks:

(Cuttle-fish bone of *Sepia officinalis.*) (See under D, III, H.)

Calcined shells, used for building-lime, and in manufacture of dentifrices and enamel. (See under III, H.)

i. Derived from radiates:

a. Limes, derived from calcining coral and coral rock.

30. CHEMICAL PRODUCTS, &c —Continued.
    - *k.* Derived from protozoans:
        - Burnt sponge, formerly used in medicine.
        - Infusorial earth, and its applications. (See above, under K.)

31. FERTILIZERS.
    - *a.* Natural guanos:
        - Bat guano from caves.
        - Bird guano from oceanic islands.
    - *b.* Artificial guanos:
        - Menhaden guano.
        - Herring guano.
        - White-fish guano.
        - Other fish guano.
    - *c.* Artificial fertilizers:
        - Bone-dust ground for use.
        - Bone phosphates.
        - Dried meat from refuse of slaughter-houses.
        - Poudrettes.
        - Other animal fertilizers.

32. LIMES. (See under 30.)

33. OTHER MATERIALS NOT MENTIONED.

SECTION E.

PROTECTION AND CULTURE.

I. INVESTIGATION.

1. METHODS OF THE UNITED STATES FISH COMMISSION.

a. Methods of work:
- Apparatus for collecting specimens, (see under B.)
- Apparatus for physical research.
- Appliances for working up results.
- (This should include a model of coast laboratory with all its fittings.)

b. Results of work:
- Publications of the commission.
- Collections, (see under A, V to VIII.)
- Photographs, &c.

II. PROTECTION

2. PRESERVATION OF GAME, FISH, &c.:

* *From man.*

a. Game laws.

** *From artificial obstructions.*

b. Fish-ways:[1]
- Gap fish-ways.
- Trench, ditch, or "Cape Cod" fish-ways.
- Oblique grove fish-ways:
  - Single groove.
  - Brewer's.
  - Mather's.
- Step fish-ways:
  - Box or pool fish-ways:
    - Overflowing, (old style.)
    - With passage-way cut down to the floor, (Smith's.)
    - With passage-way submerged, (Cail's.)
  - With contracting galleries, (Pike's.)
  - With transverse-sloping floors, (Steck's.)

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[1] Classification proposed by C. G. Atkins.

2. PRESERVATION OF GAME, FISH, &c.—Continued.
    - *b.* Fish-ways:
        - Steps contrived by arrangement of rocks and bowlders.
        - Inclined plane without steps:
            - Plain, (Pennsylvania.)
        - With partitions at right angles:
            - "Rectangular compartment."
            - Brackett's.
        - With oblique partitions:
            - Foster's.
            - Swazey's.

*** *From natural enemies.*

- *c.* Apparatus for destroying injurious species:
    - Oyster-bed tangles, (see under B, 12.)

3. CARE OF ANIMALS IN CAPTIVITY.
    - *a.* Tethers and hopples.
    - *b.* Cages and pens:
        - Kennels for dogs, &c.
        - Cages for animals.
        - Cages for birds.
        - Cages for insects.
        - (West India fire-fly trap.)
    - *c.* Fish-cars and other floating-cages for aquatic animals.
    - *d.* Aquaria:
        - Globes.
        - Aquaria.
    - *e.* Hives and other cages for insects.
    - *f.* Live-boxes, troughs, &c., for microscopists' use.
    - *g.* Fish-ponds, fish-farms, (models.)
4. ENEMIES OF USEFUL ANIMALS.
    - *a.* Intestinal worms and other internal parasites.
    - *b.* Fish-lice, barnacles, and other external parasites.
    - *c.* Predatory animals not elsewhere exhibited.

III. PROPAGATION.

5. PROPAGATION OF MAMMALS.
    - *a.* Methods of mink culture.
    - *b.* Methods of culture of domesticated animals.

6. PROPAGATION OF BIRDS.
   - *a.* Methods of ostrich culture.
   - *b.* Methods of culture of domesticated birds, fowls, &c.

7. PROPAGATION OF REPTILES.
   - *a.* Methods of terrapin culture.

8. PROPAGATION OF AMPHIBIANS.
   - *a.* Methods of frog culture.

9. PROPAGATION AND CULTURE OF FISHES.[1]
   - *a.* Accessories of obtaining and impregnating ova:
     - Pans, pails, &c.
     - Strait-jackets used in spawning salmon.
     - Spawning-race, (Ainsworth.)
     - Roller-spawning screen, (Collins.)
     - Spawning-vat, (Bond.)
   - *b.* Hatching-apparatus:
     - Troughs:
     - Plain.
     - Gravel-bottomed.
     - With sieve-bottom trays:
       - Brackett's.
       - Williamson's.
       - Clark's.
     - Vats or cases:
       - Holton's.
       - Roth's.
       - Glass-grilled boxes, (Coste's.)
     - Jars and tin-vessels:
       - Bell and Mather's.
       - M. A. Green's.
       - Ferguson's.
       - Chase's.
     - Hatching-boxes, (floating:)
       - Seth Green's shad-box.
       - Brackett's shad-box.
       - Brackett's shad-box, (No. 2.)
       - Bryant's shad-box.
       - Stilwell & Atkins's shad-box.
       - Bannister's shad-box.

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[1] Classification proposed by J. W. Milner.

9. PROPAGATION AND CULTURE OF FISHES—Continued.

- *b.* Hatching-apparatus:
  - Hatching-boxes, (floating:)
    - Adhesive eggs apparatus:
      - Vertical wire-cloth trays.
      - Hatching-basket.
  - Brook shanty, (Furman's.)
  - (Bay or cove barriers, Professor Rasch's.)
  - Accessories:
    - Tanks.
    - Nests.
    - Trays.
    - Grilles.
    - Gravel-filters.
    - Flannel screens.
    - Shallow troughs or tables (for picking eggs.)
    - Egg-nippers.
    - Cribbles.
    - Pipettes.
    - Skimmer-nets.
    - Feathering quills and brushes.
    - Rose-nozzles, (for washing eggs.)
    - Syringes, bulb, &c.
    - Shallow pans.
    - Aerating-pipe.
- *c.* Transporting apparatus:
  - Apparatus for transporting eggs:
    - Cans.
    - Case of cups, (Wilmot's.)
    - Case of cups, (Clark's.)
    - Case of trays, (Clark's.)
    - Moss-crates, (Stone's.)
  - Apparatus for transporting fish:
    - Barrels.
    - Cans, plain.
    - Cans with aerating accessories:
      - Slack's.
      - Clark's.
      - Creveling.
      - M. A. Green's.

9. PROPAGATION AND CULTURE OF FISHES—Continued.
    - *c.* Transporting apparatus:
        - Apparatus for transporting fish:
            - Tanks with aerating accessories:
            - Tanks, with attachment of band-wheel to car-axle, (Stone's.)
            - (Tanks, with Freiburg aerating apparatus.)
            - Aquarium-car, (Stone's.)
            - Live-box, (Atkins's.)
            - Accessories:
                - Air force-pumps.
                - Siphons.
                - Siphon-tubes.
                - Bellows.
                - Roses, aerating.

10. PROPAGATION OF INSECTS.
    - *a.* Propagation of silk-worm:
        - Specimens of plants used for food.
        - Model of house and its appliances.
    - *b.* Propagation of cochineal insect.
    - *c.* Propagation of bees:
        - For hives, (see under E. 3.)

11. PROPAGATION OF WORMS.
    - *a.* Propagation of leeches.

12. PROPAGATION OF MOLLUSKS.
    - *a.* Methods of oyster culture:
        - Stools for receiving spat, natural and artificial.
        - Other apparatus.

13. PROPAGATION OF CORALS.

14. PROPAGATION OF SPONGES.

Goode
April 4, 76

Department of the Interior:

U. S. NATIONAL MUSEUM.

—6—

BULLETIN

OF THE

UNITED STATES NATIONAL MUSEUM.

NO. 6.—CLASSIFICATION OF THE COLLECTION TO ILLUSTRATE THE ANIMAL RESOURCES OF THE UNITED STATES,

A LIST OF SUBSTANCES DERIVED FROM THE ANIMAL KINGDOM, WITH
SYNOPSIS OF THE USEFUL AND INJURIOUS ANIMALS
AND A CLASSIFICATION OF THE METHODS
OF CAPTURE AND UTILIZATION.

BY

G. BROWN GOODE.

PUBLISHED UNDER THE DIRECTION OF THE SMITHSONIAN INSTITUTION.

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CLASSIFICATION

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By G. BROWN GOODE, M. A.
ASSISTANT CURATOR U. S. NATIONAL MUSEUM.

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ADVERTISEMENT.

This work is the sixth of a series of papers intended to illustrate the collections of Natural History and Ethnology belonging to the United States and constituting the National Museum, of which the Smithsonian Institution was placed in charge by the act of Congress of August 10, 1846.

It has been prepared at the request of the Institution, and printed by authority of the honorable Secretary of the Interior.

JOSEPH HENRY,
Secretary Smithsonian Institution.

SMITHSONIAN INSTITUTION,
Washington, February, 1876.

PREFACE.

The following classification has been prepared by Mr. Goode to facilitate the work of collecting and arranging the material gathered by the National Museum to illustrate the resources of the United States as derived from the animal kingdom, in the International Exhibition of 1876. It is also intended to indicate the general character of the articles which are to be included in this branch of the exhibition.

Contributions of specimens of the different classes enumerated are much desired, for the purpose of making the proposed display complete, and should be addressed to the Smithsonian Institution, Washington, D. C.

JOSEPH HENRY,
Secretary Smithsonian Institution.

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INTRODUCTION.

The system proposed in the following lists has been hurriedly prepared, and is necessarily very incomplete; it is intended merely as a provisional classification, to be used in collecting the materials for the exhibition, and in their preliminary arrangement.

The first group, SECTION A, is an index to the whole series; it will include all North American animals which are directly beneficial or injurious to man. Although every species, down to the very least, exercises some influence upon human well-being, it seems scarcely practicable to attempt the exhibition of those which affect it only indirectly. Those species are considered useful which supply food, clothing, shelter, implements, materials, and amusement; those injurious which endanger the life or personal comfort of man, or destroy those animals and plants which are of direct benefit to him. In the enumeration of animals, the names of the orders are given, followed in parenthesis by the best-known names of the more important species included, and a brief note on their principal uses. This enumeration, being simply of convenience, makes no claim to zoological precision.

SECTION B embraces all instruments and methods employed by the hunters, trappers, and fishermen of North America, aboriginal and civilized. Not only those which are directly employed in destruction or capture are included, but the means made use of in pursuing or attracting the animals and fishes, and the personal equipment of the pursuer. The collection will be a monograph of *all* matters relating to the chase and the fisheries of the country. In preparing the classification here submitted, the principles of zoölogical classification have been followed as closely as possible; each distinct form has been considered a species; and the specific forms have been grouped into genera, families, and orders according to the general balance of their affinities. Form and manner of use have not been without weight, but superficial resemblance has been set aside, and the *idea* given the first importance. Thus, barbed spears and harpoons have been placed with the "hooked instruments," while plain spears and lances are grouped with the knives and clubs. In studying the place of the fire-arms and bows and arrows, the missile itself has been regarded as more important than the machine which propels it, and the latter is placed in a subordinate relation.

In one group, that of nets, convenience in arrangement of the specimens seems to demand that *material*, a character of small importance, shall be made prominent. Two widely diverging groups of apparatus are associated under the head of nets, viz, encircling-nets, the true relations of which are with grasping and scooping instruments, and entangling nets which belong with the traps, where a third group of nets, the pound and weir nets are actually classed. Where the exigencies of administration of the specimens demand that they should be arranged otherwise than in their exact systematic position, full cross-references are given.

The simplest implements have always been placed first, the series advancing in the order of complication of structure. Thus we have in the beginning the apparatus of direct application, or tools, including, first, those implements which are used in the hand, and which increase its power in a simple way, such as clubs and slung-shot, which merely add to the weight of the fist, followed by the knives, axes, and spears, which in their simplest and primitive form were sharpened stones and pointed sticks. Second, are the grasping-implements, or those by which the power of the fingers is extended. In this series the same principle of progress from simple to complex is followed; in the scoop we have the idea of the hollow palm of the hand developed in various forms, while the grasping-hooks and grasping-lines are the artificial extensions of the human finger. Under hooked instruments, the simple hooks, or those which are attached to the object by a single motion, a pulling one, are placed first, followed by the barbed implements, in which the attachment is made by a thrusting, succeeded by a pulling motion, and then by the tongs and forceps, which are essentially double hooks. The succeeding division is that containing the lasso and bolas, which are worked at long distances and require great skill, succeeded by the tangles, which are, in principle, assemblages of lassos, entangling objects among their fiber nooses.

In the third division, that of missiles, the same principle of succession is adhered to. First are placed those missiles which are propelled by the unaided arm; then those in using which the arm is artificially lengthened, as with the sling, string, or darting stick; then those in which the propelling power is derived from the elasticity of rods and cords, the strength of the arm having become subsidiary; closing with those in the use of which the strength of the arm is of no essential value, and the propelling power originates in chemical combustion.

Accessory to these are groups containing those articles used in the manufacture, testing, loading, and transportation of these missiles, and the machines which drive them through the air.

In a fourth division is the apparatus of angling, which is separated from hooked implements with which the form of the articles would naturally place them, since they are not implements of grasping, but partake of the nature of traps, being in part automatic.

The group of nets is a heterogeneous one, as has been stated above, consisting of two divisions, the first that of entangling-nets, belonging properly with traps, while encircling-nets are in idea instruments for grasping.

In arranging traps a logical succession has been preserved as far as possible. Those traps are considered the most simple in which the animal is penned by its own act, without any change in the arrangement of the trap. The pit-falls or "tipes" are first, followed by the mazes or labyrinths of greater or less complexity. Then come the traps in which the entrance is closed, either by the falling of a door or by the falling of a box-like trap, as a whole, so as to surround the animal. Under clutching-traps are placed those which seize the animal, as in the fingers, while crushing-traps are those which seize or impale it bodily. Adhesive preparations, such as bird-lime, close the series.

The accessory divisions, including hunting-animals, decoys, and disguises, and the methods and appliances of pursuit, do not admit any thorough classification, and are arranged with reference to convenience of exhibition.

SECTION C includes all methods of utilizing animals' products. It might be more satisfactorily arranged with the following section, were it not for the inconvenience of exhibiting models and tools in the same cases with the manufactured products; the arrangement of the two sections is nearly the same.

In SECTION D are grouped all useful substances derived from the animal kingdom. In order to avoid the omission of any products which are or may be obtained from North American animals, this enumeration has been made general, those not American being included in parentheses. This enumeration is far from complete, and is intended simply as an aid to future study in the same direction.

SECTION E includes all articles illustrating the culture and protection of useful animals.

SECTION A.

ENUMERATION

OF

ANIMALS BENEFICIAL OR INJURIOUS TO MAN,

(WITH A SYNOPSIS OF THEIR USEFUL APPLICATIONS.)

I. MAMMALS.

1. FERAE:

FISSIPEDIA. (Cats, pumas, jagaars, ocelots, lynxes, wolves and dogs, foxes, fishers, martens, minks, weasels, wolverenes, badgers, skunks, otters, sea-otters, bears, raccoons, and the domesticated cat, dog, and ferret.)

Useful products:

- Food, (bears, raccoon, &c.) D. 1.
- Fur, (all the group.) D. 6.
- Leather, (dog, cat.) D. 20.
- Textile fabrics, felt, (raccoon.) D. 8.
- Ivory, teeth, (bear, fox, &c.) D. 9.
- Claws used by Indians, (bears, puma.) D. 11.
- Hair, for brushes, (badger, dog, weasel, skunk, bear.) D. 21.
- Oil, (bears.) D. 27.
- Perfumes, (civet, &c.) D. 28.
- Medicinal products, (skunk.) D. 30.
- Chemical agent, *album græcum*, (dog.) D. 30.

Useful traits:

- Susceptible of domestication, (wolves (Indian dog,) foxes, otters, bears, raccoon, dog, cat, ferret.)
- Employed in hunting, (dog, cat, ferret.) B. 40.
- Employed in fishing, (otter.) B. 40.

1. FERAE—Continued.
    - FISSIPEDIA—Continued.
        - Injurious traits:
            - Enemies of man, (cats, wolves, bears.)
            - Enemies of domestic animals.
            - Marauders on crops, (bears, raccoon.)
            - Stench nuisances, (skunks.)
            - Modes of capture. B. I, II, III, VI, X.
    - PINNIPEDIA. (Fur-seals, sea-lions, hair-seals, hood-seals, sea-elephants, walruses.)
        - Useful products:
            - Food of aborigines. D. 1.
            - Fur, (fur-seals, &c.) D. 6.
            - Leather, &c., parchment from viscera, (sea-lions, hair-seals, walruses.) D. 20.
            - Oil, (hair-seal, hood-seal, sea-elephant, &c.) D. 27.
            - Ivory, (walrus.) D. 9.
        - Injurious traits: Destroy fish.
        - Modes of capture. B. I, III, V, X.
2. UNGULATA. (Bison, musk-ox, mountain-goat, mountain-sheep, antelope, moose, caribou, elk, deer, peccary, and the domesticated ox, goat, sheep, hog, horse, ass, and camel.)
    - Useful products:
        - Food, fresh, smoked, and pickled, (all the group.) D. 1, 2, 3.
        - Fur, (bison, musk-ox, goat, sheep, moose, &c.) D. 6.
        - Leather, (all the group.) D. 20.
        - Textile fabrics and felt, (ox, goat, sheep, camel, musk-ox.) D. 8.
        - Ivory and bone. D. 9.
        - Horn, (bison, ox, goat, sheep, deer, elk, &c.) D. 10.
        - Hoof, (bison, musk-ox, goat, sheep, deer, horse, &c.) D. 11.
        - Hair, bristles, and wool, (bison, ox, goat, sheep, deer, hog, camel.) D. 21.
        - Gelatine and glue. D. 4, 24.
        - Oil and fat. D. 27.
        - Perfumes, (musk-ox, musk-deer.) D. 28.
        - Coloring materials from blood and bile. D. 29.

2. UNGULATA—Continued.
    Useful products:
        Chemical products. D. 30.
        Fertilizers. D. 31.
    Useful traits: Susceptible of domestication.
    Modes of capture. B. I, II, III, VI, IX.
3. PROBOSCIDEA. (Elephants.*)
    Useful products: Ivory. D. 9.
4. SIRENIA. (Manatee, or sea-cow.)
    Useful products:
        Food. D. 1.
        Leather. D. 7, 20.
        Oil. D. 27.
5. CETE. (Whales.)
    DENTICETE. (Beluga, narwhal, porpoise, black-fish, killer, grampus, sperm-whale.)
    Useful products:
        Food, Indian, (sperm-whale, porpoise.) D. 1.
        Oils, (all the group.) D. 27.
        Spermaceti, (sperm-whale,)
        Leather, (porpoise, beluga.) D. 7, 20.
        Bone and ivory, (narwhal, sperm-whale.) D. 9.
        Perfume, *ambergris*, (sperm-whale.)
    Injurious traits: Destroy fish and seals.
    Modes of capture. B. I, II, III, X.
    MYSTICETE. (Right, or whale-bone whales.)
    Useful products:
        Food, (right-whale.) D. 1.
        Baleen. D. 12.
        Oil, (right-whale, &c.) D. 27.
6. CHIROPTERA. (Bats.)
    Useful products:
        Food, Indians. D. 1.
        Felting material. D. 8.
        Guano. D. 31.
    Useful traits: Destroy troublesome insects.
    Injurious traits: Disseminate troublesome insects.

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* *Elephas primigenius,* found fossil in North America.

7. INSECTIVORA. (Moles and shrews.)
    - Useful products:
        - Fur, (moles.) D. 6.
        - Felting material, (moles.) D. 8.
    - Useful traits:
        - Destroy burrowing insects, &c.
    - Injurious traits: Burrowers.
    - Modes of capture. B. VI.

8. GLIRES. (Squirrels, prairie-dogs, showtl, marmots, musquash, beaver, rats, mice, lemmings, porcupines, rabbits, and the domesticated rabbit, and Guinea-pig.)
    - Useful products:
        - Food. D. 1.
        - Fur, (squirrels, showtl, marmots, musquash, beaver, lemmings, rabbit, &c.) D. 6.
        - Textile fabric, felt, (musquash, beaver, rabbit.) D. 8.
        - Ivory, (beaver.) D. 9.
        - Leather, (rat, beaver.) D. 7, 20.
        - Hair and down, (rabbits.) D. 21.
        - Quills, (porcupine.) D. 21.
        - Perfume, *castoreum*, (beaver.) D. 28.
    - Useful traits: Susceptible of domestication, (squirrels, rabbits, &c.)
    - Injurious traits: Marauders.
    - Modes of capture. B. I, II, III, VI, VII, VIII, IX.

9. BRUTA. (Armadillo, &c.)
    - Useful products: Shell used by Indians in various manufactures. D. 14.
    - Injurious traits:
        - Burrower.
        - Marauder.

10. MARSUPIALIA. (Opossum.)
    - Useful products:
        - Food. D. 1.
        - Hair used in felting. D. 8.
    - Injurious traits: Marauder.
    - Modes of capture. B. I, II, III, VI, VIII

II. BIRDS.

11. PASSERES. (Thrushes, stone-chats and blue-birds, dippers, kinglets, titmice, nuthatches, creepers, wrens, larks, wagtails, warblers, tanagers, swallows, waxwings, greenlets, shrikes, finches, starlings, black-birds and orioles, crows and jays, fly-catchers, and domesticated sparrow, canary, &c.)

- Useful products:
  - Foods, (thrushes, rice-birds, &c.) D. 1.
  - Ornamental feathers. D. 23.
- Useful traits:
  - Destroy insects.
  - Song-birds, (generally susceptible of domestication.)

12–13. PICARIÆ AND CUCULI. (Night-hawks, whippoorwills, swifts, humming-birds, trogons, saw-bills, kingfishers, cuckoos, woodpeckers.)

- Useful products: Ornamental feathers, (humming-birds, trogons.) D. 23.
- Useful traits:
  - Destroy noxious insects, (night-hawks, swifts.)
  - Destroy tree-borers, (woodpeckers.)
- Injurious traits:
  - Destroy fish, (kingfishers.)
  - Destroy birds'-eggs, (cuckoos.)
  - Destroy fruit, (woodpeckers.)
  - Destroy trees, (sap-sucker.)

14. PSITTACI. (Parroquet and domesticated parrots.)

- Useful products: Ornamental feathers. D. 23.
- Useful traits: Susceptible of domestication.

15. RAPTORES. (Owls, hawks, eagles, vultures, buzzards.)

- Useful products:
  - Ornamental feathers. D. 23.
  - Quills. D. 22.
- Useful traits:
  - Susceptible of domestication and use in hunting.[1]

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[1] Nine species of falcons, hawks, and owls have been employed in the chase by Europeans.

15. RAPTORES—Continued.

Useful traits:
Scavengers, (vultures, buzzards.)
Destroy vermin, (owls, hawks.)
Injurious traits: Destroy domestic animals, eggs, &c.

16. COLUMBÆ. (Pigeons and doves.)

Useful products:
Food.
Ornamental feathers. D. 23.

Useful traits:
Game-birds.
Susceptible of domestication.
Used as targets, (wild pigeon.) B. 25.
Used as carriers, (carrier-pigeon.)

17. GALLINÆ. (Turkey, grouse, partridge, sage-cock, ptarmigan quail, and the domesticated peacock, guinea-fowl, and fowl.)

Useful products:
Foods, flesh. D. 1.
Ornamental feathers. D. 23.
Quills. D. 22.
Albumen. D. 30.

Useful traits:
Game-birds.
Susceptible of domestication.

18. LIMICOLÆ. (Plover, ring-neck, surf-bird, oyster-catcher, turnstone avoset, stilt, phalarope, woodcock, snipe, sandpiper dunlin, godwit, sanderling, willet, tattler, yellow shanks, green-shanks, curlew.)

Useful products:
Food: Flesh. D. 1.
Eggs. D. 1.
Feathers. D. 23.
Useful traits: Game-birds.

19. HERODIONES. (Ibises, spoonbills, herons, egrets, bitterns.)
Useful products: Ornamental feathers. D. 23.
Useful traits: Destroy vermin.

20. ALECTORIDES. (Cranes, rails, crakes, gallinules, coots.)
    Useful products:
        Food, (rails, crakes.) D. 1.
        Feathers. D. 23.
        Useful traits: Susceptible of domestication, (cranes.)
21. LAMELLIROSTRES. (Flamingoes, swans, geese, ducks.)
    Useful products:
        Food: Flesh, (geese, ducks.) D. 1.
            Eggs, (geese, ducks.)
        Ornamental feathers, (flamingo, geese, &c.) D. 23.
        Down, (geese, ducks.) D. 23.
    Useful traits:
        Susceptible of domestication, (geese, ducks.)
        Used as decoys for other swimmers, (brants, ducks.)
22. STEGANOPODES. (Gannets, pelicans, cormorants, darters or water-turkeys, frigate birds, tropic birds.)
    Useful products:
        Ornamental feathers, (darters, tropic birds.) D. 23.
        Leather, (of feet.) D. 20.
    Useful traits: Susceptible of domestication.[1]
23. LONGIPENNES. (Gulls, terns, skimmers, petrels, albatrosses shearwaters.)
    Useful products:
        Food, eggs. D. 1.
        Ornamental feathers, (gulls, terns, &c.) D. 23.
        Oil, (petrels, &c., used by Eskimos.) D. 27.
24. PYGOPODES. (Loons, grebes, auks, puffins, guillemot, murres.)
    Useful products:
        Foods, (eggs.) D. 1.
        Ornamental feathers, (grebes.) D. 23.
        Feathers used as furs, (grebes, auks, &c.) D. 8.
25. SPHENISCI. (Penguins.)
    Useful products:
        Feathers used as fur. D. 6.
        Oil. D. 27.

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[1] *Graculus carbo* used in Europe for fishing and a similar species in China.

III. REPTILES.

26. CROCODILIA. (Alligator, crocodile.)
    - Useful products:
        - Food. D. 1.
        - Ivory. D. 8.
        - Leather. D. 20.
        - Oil. D. 27.
        - Musk. D. 28.
    - Injurious traits:
        - Enemies of man and domestic animals.
27. TESTUDINATA. (Tortoises, terrapin, leather-back, green, loggerhead, and hawks-bill turtles.)
    - Useful products:
        - Food: Flesh, (green turtle, terrapin, gopher tortoise.) D. 1.
Eggs, (green turtle, terrapin, gopher tortoise.)
        - Oil from eggs, (green turtle.) D. 27.
        - Shell, (turtles.) D. 13.
        - Perfume. D. 28.
    - Methods of capture and transportation. E. 3.
28. LACERTILIA. (Lizards, skinks, horned-toads, chameleons, scorpions, joint-snakes, &c.)
    - Useful products: Food of Indians. D. 1.
    - Medicinal product: (Skink.) D. 30.
    - Useful traits: Destroy noxious insects.
29. OPHIDIA. (Snakes.)
    - Useful products:
        - Leather, (rattlesnakes, bull snakes.) D. 27.
        - Medicinal products, (rattlesnakes, copperheads.) D. 30.
        - Oil, (rattlesnakes.) D. 27.
    - Useful traits: Destroy vermin.
    - Injurious traits: Enemies of man, (rattlesnakes, copperheads, and moccasins.)

IV. AMPHIBIANS.

30. ANURA. (Frogs, toads, hyla, &c.)
    - Useful products:
        - Food, (frogs.) D. 1.
        - Material for physiological instruction, (frogs.)

30. ANURA—Continued.
   - Useful products:
      - Weather indicators, (hyla.)
   - Useful traits: Destroy noxious insects, (toads.)

31. URODELA. (Salamanders, axolotls, and menopomes.)
   - Useful products: Foods, aboriginal, (axolotls.)
   - Useful traits: Aquarium use.
   - Injurious traits: Enemies of young fish.

32. PROTEIDA. (River-dogs, hell-benders.)
   - Injurious traits: Enemies of young fish.

33. TRACHYSTOMATA. (Sirens.)

V. FISHES.

34. PEDICULATI. (Sea-bats or devil-fish, goose-fish or angler, mouse-fish, &c.)
   - Useful products: Baits, (goose-fish.) D 1.
   - Injurious traits: Enemies of aquatic birds, (goose-fish.)

35. PLECTOGNATHI. (Sun-fish, rabbit-fish, porcupine-fish, swell-fish, box-fish, trunk-fish, cow-fish, file-fish, trigger-fish.)
   - Useful products:
      - Food, (file-fish, trunk-fish.) D. 11.
      - Clothing, (helmets made from porcupine-fish.) D. 20.
      - Oils, used in medicine, (sun-fish.) D. 27.
      - Shagreen, (file-fish, trigger-fish.) D. 30.

36. LOPHOBRANCHII. (Sea-horse, pipe-fish.)
   - Useful traits: Aquarium use.

37. HEMIBRANCHII. (Snipe-fish, trumpet-fish, stickleback.)
   - Useful traits: Aquarium use, (sticklebacks.)
   - Injurious traits: Destroy eggs of other fishes.

38. TELEOCEPHALI:
   - HETEROSOMATA, (soles, flounders, flatfish, turbot, halibut.)
      - Useful products:
         - Foods: Fresh. D. 1.
            - Smoked, (halibut.) D. 2.
            - Pickled, (halibut.) D. 3.
         - Baits, D. 5.

38. TELEOCEPHALI—Continued.

ANACANTHINI, (cod, pollock, haddock, hake, ling, cusk, burbot, rockling, lance.)

Useful products:

Food: Fresh. D. 1.

Salted, wet, (cod,) (cods' sounds, tongues.) D. 3.

Salted, dry, (cod, haddock, hake.) D. 2.

Bait, (lance.) D. 5.

Isinglass, (cod, haddock, hake.) D. 24.

Leather, (N. W. coast Indians, cod.) D. 27.

Oil, (cod, haddock, hake, livers.) D. 30.

ACANTHOPTERI, (Wolf-fish, blenny, oyster-fish, toad-fish, lump-fish, sea-snail, goby, sea-robin, gurnard, sculpin, sea-raven, Norway haddock or hemdurgan, red-fish, rock cod (west coast), black-fish, or tautog, cunner or chogset, parrot-fish, viviparous-fish (west coast), surgeon-fish, angel-fish, chætodons, sword-fish, bayonet-fish, scabbard-fish, mackerel, cero, tunny, bonito, crevallé, pompano, pilot-fish, dolphin, butter-fish, weak-fish, drum, croaker, king-fish, whiting, bass, sheepshead, scup or porgy, grunts or pig-fish, black bass, sunfish, strawberry bass, rock bass, perch, groupers, striped bass or rock-fish, blue-fish, tailor, cobia, remora, barracuda.)

Useful products:

Food: Fresh. D. 1.

Salted, wet, (sword-fish, mackerel, tunnies, pompanoes, blue-fish.) D. 2.

Baits. D. 5.

Isinglass, (weak-fish, drum, &c.) D. 24.

Ornament, scales, (parrot-fish, drum.) D. 14.

Injurious traits:

Poisonous, (barracuda, dolphin, &c.)

Enemies of vessels, (sword-fish, bayonet-fish.)

Parasitic on useful fishes, (remora, toad-fish, and sea-snail, (on oysters and pectens,) &c.)

Bait-thieves, (sculpins.)

38. TELECOPHALI—Continued.

PERCESOCES. (Atherines, mullet.)

Useful products:

Food: Fresh. D. 1.

Salted, smoked, (mullet, mullet-spawn.) D. 2.

Salted, wet, (mullet.) D. 3.

Bait, (atherines.) D. 5.

Scales, (mullet.) D. 14.

SYNENTOGNATHI. (Gar-fish, flying-fish.)

Useful products:

Food: Fresh. D. 1.

Salted, smoked, (gar-fish, flying-fish.) 1.

HAPLOMI. (Blind-fish, pike, pickerel, minnows.)

Useful products:

Food, (pike, pickerel.) D. 1.

Bait, (minnows.) D. 5.

Injurious traits:

Enemies of other fishes and of aquatic birds, (pikes, pickerels.)

ISOSPONDYLI. (Capelin, oulachan, smelt, white-fish, salmon, trout, tarpum, herring, menhaden, shad, alewife or gaspereau, anchovy, &c.)

Useful products:

Food: Fresh. D. 1

Salted, (shad, salmon, white-fish, herring, &c.) D. 2.

Smoked, (herring, salmon, &c.) D. 1.

Canned, (salmon, menhaden, sardines, &c.) D. 1.

Eggs. D. 1.

Sauce, (anchovy.) D. 3.

Oil, (salmon, oulachan, white-fish, menhaden, herring.) D. 27.

Bait, (capelin.) D. 5.

Ornamental scales, (tarpum.) D. 14.

Guano, (menhaden, herring, &c.) D. 31.

Modes of culture. E. 9.

EVENTOGNATHI. (Suckers, dace, buffalo-fish, carp, tench, &c.)

Useful products:

Food. D. 1.

Bait. D. 5.

Artificial pearls. D. 29.

Modes of culture, (including domesticated species.) E. 9.

39. NEMATOGNATHI. (Cat-fish, "bull-heads," &c.)
    - Useful products:
        - Food. D. 1.
        - Guano, (cat-fish.) D. 31.

40. APODES. (Eels, congers.)
    - Useful products:
        - Food. D. 1.
        - Bait, eel-skins. D. 5.
        - Leather, (eels.) D. 20.

41. CYCLOGANOIDEI. (Mud-fish, or amia.)

42. RHOMBOGANOIDEI. (Gar-pikes.)
    - Useful products: Scales, used for arrow-tips. D. 14.
    - Injurious traits: Enemies of other fish.

43. SELACHOSTOMI. (Paddle-fish, or spoon-bill)

44. CHONDROSTEI. (Sturgeons.)
    - Useful products:
        - Foods: Fresh. D. 1.
            - Smoked. D. 1.
            - Eggs, pickled, (caviare.) D. 3.
            - Chorda-dorsalis, dried, (veziga.) D. 2.
            - Isinglass, (sturgeon.) D. 24.
        - Oil. D. 27, T.
        - Scales. D. 14.
    - Useful traits: Scavengers.
    - Injurious traits: Said to destroy eggs of white-fish.

VI. ELASMOBRANCHIATES.

45. HOLOCEPHALI. (Chimæra, or king of the herrings.)

46. RAIÆ. (Skates, rays, "devil-fish.")

47. SQUALI. (Sharks.)
    - Useful products:
        - Food, (sharks, skates.) D. 1.
        - Bone, (sharks.) D. 9.
        - Oil, livers, (sharks, rays, &c.) D. 27.
        - Shagreen, (sharks.) D. 20.
    - Injurious traits: Enemies of man and fishes.

VII. MARSIPOBRANCHIATES.

48. HYPEROARTIA. (Lamprey-eels, or nine eyes.)
49. HYPEROTRETI. (Suckers, or hags.)
 Useful products: Food, (lamprey-eels.) D. 1.
 Useful traits: Scavengers, (hags.)

VIII. LEPTOCARDIANS.

50. CIRROSTOMI. (Amphioxus.)
 Modes of capture. D. 6.

IX. INSECTS.

51. HEXAPODA. (Bees, butterflies and moths, flies, beetles, bugs and lice, grasshoppers and crickets, dragon-flies and caddice flies.)
 Useful products:
  Food of aborigines.
  Honey, (bees, &c.) D. 1.
  Wax, (bees, &c.) D. 30.
  Baits, (flies, bees, dragon-flies, beetles and their larvæ, grasshoppers, &c.) D. 5, B. 45.
  Silk, (moths.) D. 8.
  Coloring material, (cochineal insect, &c.) D. 29.
  Blistering preparations, (Spanish-flies, &c.) D. 30.
  Wings used in the arts, (beetles.) D. 19.
 Useful traits:
  Puncture trees, producing galls, manna, lac, &c.
 Injurious traits:
  Injurious to vegetation, (numerous species.)
  Internal and external parasites, (flies.)
52. MYRIAPODA. (Centipedes, millipedes.)
 Useful products: Food of aborigines, (eggs.) D. 1.
 Injurious traits: Venomous, (centipedes, millipedes.)

X. ARACHNEANS.

53. ARACHNIDA. (Spiders, scorpions, mites, &c.)
 Useful products:
  Fine threads used by opticians, (spiders.)
  Silk, (spiders.)

53. ARACHNIDA—Continued.
  Useful traits: Destroy noxious insects, (spiders.)
  Injurious traits:
    Venomous, (scorpions.)
    Parasites, (mites.)

XI. ARTHROPODS.

54. CRUSTACEA. (Crabs, lobsters, shrimps, prawns, crawfish, limnoria, fish-lice, lernæans, sand and water fleas, barnacles, horseshoe crabs, &c.)
  Useful products:
    Foods, (fresh and canned crabs, lobsters, shrimps, prawns, crawfish, lobsters.)
    Baits, (crabs, lobsters, shrimps, prawns, &c.)
    Manures, (horseshoe crabs.)
  Useful traits: Skeleton cleaners, (beach fleas, &c.)
  Injurious traits:
    Parasites on fishes and marine mammals, (barnacles, fish-lice, &c.)
    Destroy earthworks, dams, &c., (crawfish.)
    Destroy submerged timbers, (limnoria, &c.)
  Modes of protection against injurious species. E. 4.
  Methods of capture. D. 7, 31, 32.

XII. WORMS.

55. ANNELIDA. (Sipunculoids, leeches, earth-worms, serpulæ, sea-worms, &c.)
  Useful products:
    Food of aborigines, (earth-worms.) D. 1, 2.
    Baits, (earth-worms, sea-worms.) D. 5.
  Useful traits:
    Used in surgery, (leeches.)
    Used as barometers, (leeches.)
  Injurious traits: External parasites of animals, (leeches.)
  Methods of culture, (leeches.) E. 11.

56. SCOLECIDA. (Tape-worms and flukes, planarians, nemerteans, trichinæ, thread-worms, rotifers, &c.)
  Injurious traits: Internal parasites, (numerous species.)

XIII. MOLLUSKS.

57. CEPHALOPODA. (Octopus, nautilus, argonauts, calamaries or squids.)

Useful products:

Food, (squids and their eggs.) D. 1.

Bait, fresh and salted, (octopus, squids.) D. 1, 5.

Ink, sepia, (sepias.) D. 29.

"Bone," used as food for animals. D. 5.

"Bone," used in arts and manufactures. D. 19.

58. GASTROPODA. (Land-snails, sea-snails, whelks, limpets, &c.)

Useful products:

Food, (numerous species.) D. 1, 2.

Bait, (limpets, &c.) D. 5.

Nacre, (top-shells, ear-shells, &c.) D. 15.

Shell used in arts and manufactures. D. 16.

Useful traits:

Carrion-feeders, (strombus and other siphonated genera.)

Food of useful animals.

Injurious traits:

Predatory on other mollusks, (murex, buccinum, natica, &c.)

Injurious to vegetation.

59. CONCHIFERA. (Ordinary bivalve shells.[1])

Useful products:

Food, fresh, dried, and pickled, (numerous species.) D. 1, 2, 3.

Baits, (clams, mussels, &c.) D. 5.

Pearls and nacre, (river-mussels, pearl-oysters, &c.) D. 15.

Shell used in arts and manufactures. D. 16.

Injurious traits: Borers in wood and stone, (ship-worms, pholas, gastrochæna, date, shells, saxicava, ungulina, &c.)

XIV. RADIATES.

60. ECHINODERMATA. (Sea-cucumber, sea-urchins, star-fishes, ophiurans.)

Useful products:

Food, fresh, (sea-urchins and their eggs.) D. 1.

Food, dried, (bêches le mer.)

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[1] *Tunicata*, *brachiopoda*, and *bryzoa* are omitted, on account of their very remote usefulness.

60. ECHINODERMATA—Continued.
  Injurious traits:
    Burrowers, (various echinoids.)
    Destroyers of useful mollusks.

61. CŒLENTERATA. (Acalephs, polyps, &c.)
  Useful products: Coral, various species of polyps.) D. 17.
  Injurious traits: Clog seines, weirs, and fishing-lines, (acalephs.)

XV. PROTOZOANS.

62. RHIZOPODA. (Sponges and foraminifera.)
  Useful products:
    Food, "mountain meal," (foraminifera.) D. 1
    Infusorial earths, (foraminifera.) D. 18.
    Sponges, used in arts and manufactures. D. 26.

SECTION B.

(THE CHASE AND THE FISHERIES.)

MEANS OF PURSUIT AND CAPTURE.

I. HAND IMPLEMENTS OR TOOLS.

* *For striking.*

1. CLUBS:
   - *a.* Unarmed clubs:
     - Salmon-clubs, used by the Indians of the Northwest coast.
     - Other fishing-clubs.
     - Hunting-clubs.
   - *b.* Armed clubs:
     - Stone-headed clubs.
     - Clubs, armed with teeth or bone points.
     - Clubs, armed with metal points.
2. SLUNG-WEIGHTS:
   - *a.* Slung-stones.
   - *b.* Slung-shot.
   - *c.* ("Morning stars.")
   - *d.* ("Flails.")

** *For cutting.*

3. KNIVES:
   - *a.* Straight knives:
     - Hunting-dirks and daggers.
     - Hunting-knives, scalp-knives, &c.
     - Blubber-knives, aboriginal and recent.
     - Boarding-knives used by whalemen.
     - Whaleman's boat-knives.
     - Bowie-knives.
     - Flaying-knives, aboriginal and recent.
     - Splitting-knives.
     - Heading-knives.
     - Sailors' and fishermen's sheath-knives.
     - Hunters' sheath-knives.
     - Slivering-knives, used by fishermen.
     - Oyster-knives.

3. KNIVES—Continued.
  - *a.* Straight knives:
    - Mackerel rimmers or fatting knives.
    - (Swords, including the various forms incidentally used in hunting, sabers, cutlasses, machétes, creases, &c.)
    - Stone and bone knives, used by Indians and Eskimos.
    - Skin scrapers and parers, used in preparing leather.
  - *b.* Clasp-knives:
    - Sailors' clasp-knives.
    - Hunters' clasp-knives.
    - Clasp-dirks.
    - Jockey knives.

4. AXES:
  - *a.* Axes, proper:
    - Tomahawks.
    - Hatchets.
    - Whaleman's boat-hatchets.
    - Cleavers.
    - Axes, used by fishermen and hunters.
    - Head-axes for whalemen.
  - *b.* Cutting-spades:
    - Whale-spades:
      - Cutting-spades.
      - Throat-spades, flat and round shank.
      - Wide spades.
      - Half-round spades.
      - Head-spades.
    - Blubber-mincing knives.
    - Chopping-knives.

*** *For thrusting.*

5. THRUSTING SPEARS AND PRODS:
  - *a.* Fishing-lances.
    - Whale-lances.
    - Whaleman's boat-spades, thick and thin.
    - Seal-lances.
    - Fish-lances.
  - *b.* Hunting-spears.
  - *c.* Bayonets.
  - *d.* Prodding-awls, used in piercing the base of the brain in killing fish for the table.

II. IMPLEMENTS FOR SEIZURE OF OBJECT.

** Scooping-instruments.*

6. SCOOPS.

† For hand-use.

a. Shovels:
    Clam-shovels.
    Trowels used in taking burrowing shore animals.
    Hand-scoops.
b. Hand-dredges, used in collecting mollusks.
c. Pile-scrapers.

†† For use with sounding-lines.

d. Armed leads:
    Common "deep-sea lead."
    Deep-sea-sounding apparatus.
e. Cup-leads.
f. Scoop sounding-machines.

*** Grasping-hooks.*

7. HOOKED INSTRUMENTS. (Those used with a single motion, that of hooking:)

a. Single-pointed hooks:
    Gaff-hooks.
    Boat-hooks.
    Jigs.
    Rabbit and squirrel hooks, used by the Ute Indians.
    Snake-hooks.
    Clam-hooks.
    Hoes and picks used in gathering shell-fish.
    Forks used in handling salted and dried fish.
    Whalemen's hooks:
        Blubber-hooks.
        Blubber-forks.
        Junk-hooks.
        Lance-hooks.
        Can-hooks.

7. HOOKED INSTRUMENTS—Continued.
   - *b.* Many-pointed hooks:
     - Grappling-irons.
     - Lip hooks or grapnels, used by whalers.
     - Toggles, used by whalers.
     - Oyster-rakes.
     - Clam-rakes.
     - Oulachan rakes or spears.
     - Squid-jigs.
   - *c.* Twisting-rods, used in drawing small mammals from their burrows.

8. BARBED IMPLEMENTS. (Those used with two motions, the first that of thrusting:)
   - *a.* Spears with fixed heads:
     - Harpoons.
     - One-flued harpoons.
     - Two-flued harpoons.
     - Toggle-harpoons.
     - Harpoon-bullets. (See under 23.)
     - Gun-harpoons.
     - Other whaleman's "craft."
     - Barbed spears, (with single point.)
     - Grains, (with two prongs.)
     - Gigs.
     - Bird-spears.
     - Otter-spears.
     - Sea-otter spears.
     - Seal-spears.
     - Walrus-spears.
     - Eel-spears.
     - Flounder-spears.
     - Sturgeon-spears, (west coast.)
     - Octopus-spears.
     - Crab-spears, used in Rhode Island.
   - *b.* Spears with detachable heads:
     - Lily-irons.
     - Dolphin-irons.
     - Indian harpoons of shell and iron.
     - Eskimo harpoons of stone, bone, and iron.

8. BARBED INSTRUMENTS—Continued.
    - *b.* Spears with detachable heads:
        - Indian fish-harpoons.
        - Other fish-harpoons.
    - (For accessory apparatus, see under 29.)

9. TONGS, &c.

† *For hand use.*

- *a.* Tongs (with two handles:)
    - Oyster-tongs.
    - Oyster-rakes.
- *b.* "Nippers," (with cord and handle.)
    - Snake-tongs.
    - Sponge-tongs.
    - Coral-tongs.

†† *For use with sounding-lines.*

- *c.* "Clamms" for deep-sea soundings, (forceps closed by a weight.)
    - (Ross's "Deep-sea clamms.")
    - (Bull-dog sounding-machine.)

*** *Grasping-lines.*

10. NOOSES.

† *Stationary nooses.*

- *a.* Jerk-snares:
    - Bird-snares.
    - Fish snares, of wire, gut, hair, &c.

†† *Thrown nooses.*

- *b.* Lariats and lassos:
    - Lariats with rope noose, made from hair, hemp, and rawhide.
    - Lariats with metal noose.
    - (Chilian bird-lariat.)

11. LOADED LINES. (Bolas.)
    - *a.* Bird-slings, used by Eskimos.
    - *b.* Bolas, with one or several weights.)

**** *Entangling lines.*

12. TANGLES.
    - *a.* Tangles:
        - Swab-tangles.
        - (Dredge-tangles, used by English collectors.)
        - Harrow-tangles.
        - Wheel-tangles.

III. MISSILES.

* *Simple missiles, (those propelled by the unaided arm.)*

13. HURLED WEIGHTS.
    - *a.* Stones and discs thrown by the hand.
    - *b.* Weights dropped from an elevation, (dead-falls, not automatic.)
14. HURLED STICKS.
    - *a.* Straight sticks:
        - Clubs used as missiles.
    - *b.* Curved sticks:
        - Throw-sticks, used by the Moqui Indians of New Mexico in hunting rabbits.
        - (Boomerangs.)
15. HURLED SPEARS.
    - *a.* Darts and lances.

** *Centrifugal missiles. (Propelling power augmented by an artificial increase of the length of the arm.)*

16. SLINGS AND SPEARS THROWN BY STRAPS.
    - *a.* Slings.
    - *b.* Spears, with straps used in throwing them.
17. MISSILES PROPELLED BY "THROWING-STICKS."
    - *a.* Spears with throwing-sticks, used by Eskimos:
        - Series of throwing or darting sticks.

*** *Missiles propelled by a spring.—‡ Spring consisting of bent rod.*

18. BOWS AND ARROWS.
    - *a.* Bows:
        - Simple bows.
        - (Cross-bows.)
        - (Ballistas.)
    - *b.* Arrows:
        - Lance-arrows.
        - Harpoon-arrows, used in fishing.
        - Blunt or club arrows, used in killing birds.
    - *c.* Accessories of bows and arrows:
        - Holders.
        - Quivers.
        - Arrow-head pouches.

18. BOWS AND ARROWS—Continued.
    - *d.* Implements of manufacture:
        - Flint-chipping apparatus.
        - Arrow-head sharpeners.
        - Shaft-gauges.
        - Cord-twisting apparatus.
        - Shaft-polishers.
        - Glue-sticks, used in fastening head of arrow.

‡‡ *Spring consisting of elastic cord.*

19. INDIA-RUBBER SLINGS.
    - *a.* Pea-shooters, used in killing birds.

‡‡‡ *Spring consisting of metallic helix.*

20. SPRING-GUNS.
    - *a.* Spring-guns.

**** *Missiles propelled by the compression of air or water.*

21. AIR-GUNS.
    - *a.* Blow-guns, (missile propelled by the breath:)
        - Blow-guns carrying arrows.
        - Blow-guns carrying balls.
    - *b.* Piston air-guns.
    - *c.* Reservoir air-guns:
        - Air-guns.
        - Air-gun canes.
22. WATER-GUNS.
    - *a.* Syringe-guns:
        - Humming-bird guns.

***** *Fire-arms.*

23. GUNS AND PISTOLS.
    - *a.* Muzzle-loading arms:
        - With smooth bores:
            - Muskets.
            - Fowling-pieces.
            - Cane-guns.
            - Pistols:
                - Single-barreled pistols.
                - Revolvers.
        - With grooved bores: Rifles.
            - Rifle-muskets.
            - Rifle-carbines.
            - Pistols.

23. GUNS AND PISTOLS—Continued.
- *b.* Breech-loading arms:
  - With smooth bores:
    - Fowling-pieces.
    - Pistols.
  - With rifled bores:
    - Muskets.
    - Hunting rifles.
  - Carbines:
    - Single-barreled carbines.
    - Revolving carbines.
  - Pistols:
    - Pistols.
    - Revolvers.
- *c.* Whaling-guns:
  - Bomb lance and gun.
  - Harpoon ball and gun.
  - Harpoon-gun.
  - Harpoon bomb-lance gun.

24. (ACCESSORY.) AMMUNITION AND ITS PREPARATION.
- *a.* Explosives:
  - Gunpowder.
  - Gun-cotton.
  - Percussion powder:
    - Caps.
    - Needle percussion.
    - Primers.
  - Wood powder.
  - Dynamite or giant-powder.
  - Nitroglycerine.
  - Dualine.
  - Lithofracteur.
  - Colonia powder.
  - Other explosives.
- *b.* Missiles:
  - Bullets.
  - (Accessory) bullet-molds.
  - Shot.
  - (Accessory) methods of manufacturing shot.

24. (ACCESSORY.) AMMUNITION, &c.—Continued.

- *b.* Missiles:
  - Explosive bullets, shells, &c.:
    - Bomb-lance.
    - Meigs's shells.
- *c.* Wadding:
  - Bulk wadding.
  - Prepared wads.
  - (Accessory) wad-cutters.
- *d.* Ammunition-measures:
  - Measures.
  - Shot-measures. } Attached to pouches and separate.
  - Powder-measures. } Attached to pouches and separate.
  - Weighing-scales.
- *e.* Prepared ammunition:
  - Cartridges:
    - Ball-cartridges.
    - Shot-cartridges.
    - Wire-cartridges.
    - (Accessory) paper-shells.
    - (Accessory) metallic shells.
- *f.* Methods of preparing cartridges:
  - Loaders.
  - Crimpers.
  - Cappers.

25. ACCESSORIES OF LOADING, CLEANING AND REPAIRING, SIGHTING, AND TESTING FIRE-ARMS.

- *a.* Instruments for cleaning, loading, &c.:
  - Rammers.
  - Swabs.
  - Charge-drawers, "worms."
- *b.* Sights, &c.:
  - Muzzle-sights:
    - Plain sights.
    - Slit-sights.
    - Globe-sights.
    - Peep-sights.
  - Breech-sights:
    - Plain sights.
    - Graduating sights.

25. ACCESSORIES OF LOADING, &c.—Continued.

- *b.* Sights, &c.:
  - Telescope-sights.
  - Levels, attached to guns
  - Wind-gauges.
- *c.* Targets:
  - Practice-targets.
  - "Gyro-trap" targets.
  - Pigeon-traps and accessories of pigeon-shooting.
- *d.* Recoil-checks.

26. FOR CARRYING ARMS AND AMMUNITION.

- *a.* Ammunition-holders:
  - Powder-holders:
    - Horns.
    - Flasks.
    - Canisters.
  - Shot-holders:
    - Pouches.
    - Belts.
  - Cartridge-holders:
    - Pouches.
    - Boxes.
    - Belts.
    - Vests.
  - Cap-holders:
    - Pouches.
    - Boxes.
    - Cap-straps, used by Indians.
- *b.* Weapon-holders:
  - Slings for arms:
    - Shoulder-slings.
    - Saddle-slings.
    - Holsters.
  - Belts:
    - Pistol-belts.
  - Racks and cases:
    - Gun-racks.
    - Gun-cases.

IV. BAITED HOOKS. ANGLING-TACKLE.

27. HOOKS WITH MOVABLE LINES.

- *a.* Tackle for surface-fishing:
    - Fly-fishing tackle.
    - Salmon-tackle.
    - Trout-tackle.
    - Black-bass tackle.
    - Shad-tackle.
    - Trolling-tackle:
        - Trolling-tackle.
        - Whiffing-tackle.
        - Drailing-tackle.
        - Gangs of hooks for minnow-bait.
    - Surf-tackle for throwing and hauling:
        - Striped-bass tackle.
        - Redfish or bass tackle.
        - Bluefish tackle.
    - Tide-drailing tackle:
        - Pasque and cuttyhunk bass-tackle.
- *b.* Tackle for fishing below the surface:
    - Short hand-gear:
        - Mackerel-gear.
    - Deep-sea gear:
        - Cod-gear.
        - Halibut-gear.
        - Flounder-gear.
        - Shark-gear.
        - Tautog-gear.
        - Other bottom-gear.
    - Bobs:
        - Eel-bobs.

28. HOOKS, WITH STATIONARY LINES.—SET TACKLE.

- *a.* Surface lines:
    - Spilliards, or floating-trawl lines.
- *b.* Bottom-set lines:
    - Trawl-lines, or bull-tows.

29. (ACCESSORY.) PARTS AND ACCESSORIES OF ANGLING-APPARATUS AND OF HARPOON AND SEINE LINES.

a. Hooks, including a full series of unmounted hooks, of recent and aboriginal manufacture.
- Plain hooks:
  - Fly-hooks.
  - Trout-hooks.
  - Salmon-hooks.
  - Cod and halibut hooks.
  - Hooks for general use.
  - Bass-hooks.
- Jigs and drails:
  - Mackerel-jigs.
  - Blue-fish drails of bone and metal of the various patterns, Newport, Noank, Providence, Provincetown, &c.
  - Block Island drails.
  - Pearl-squids of various patterns.
  - Bone-squids.
  - Metal-squids.
  - Petticoat-squids of flannel, &c.
- Spoon-baits, plain and fluted:
  - Bass-spoons.
  - Pickerel-spoons.
  - Trout-spoons.
  - Blue-fish spoons.
  - Other trolling-spoons.
- Artificial flies on hooks:
  - Salmon-flies for each month.
  - Trout-flies for each month.
  - (Accessory.) Fly-books.

b. Lines, (twisted and plaited:)
- Silk-lines.
- Grass-lines.
- Linen-lines.
- Cotton-lines.
- Cotton-hemp lines.
- Bark-lines.
- Manila-lines.
- Hide-lines.

29. (ACCESSORY.) ANGLING-APPARATUS, &c.—Continued.

b. Lines, (twisted and plated:)
- Gut-lines.
- Lines made from sea-weed, (*Nereocystis Lütkeana,*) and used by natives of Alaska.
- (Lines of sea-weed, (*Chorda filum,*) used similarly in Scotland.)
- (Accessory.) Apparatus for twisting lines.

c. Snoods, leaders, and traces:
- "Cat-gut," (sheep,) snoods, and leaders.
- Silk-worm-gut snoods.
- Salmon-gut snoods.
- Flax-snoods.
- Gimp-snoods.
- Wire-snoods.
- "Sid-straps."

d. Whalers' chains and lines:
- Head chains and ropes.
- Fin-chains.
- Fluke chains and rings and ropes.
- Head pike and ring.
- (Accessory.) Blocks, pendants, cutting-blocks, &c.

e. Sinkers:
- Boat-shaped sinkers, plain and shearing.
- Pipe-lead sinkers.
- Bullet-sinkers.
- Plummet-sinkers, sugar-loaf, pear-shaped, and double-taper.
- Banker-sinkers.
- Seine-sinkers, of chain, lead balls, lead rings, stone, &c.
- (Accessory.) Molds for sinkers.
  - Jig-molds.
  - Other sinker-molds.

f. Spreaders:
- Chopsticks.
- One-armed chopsticks, or "revolving booms."

g. Floats:
- Line-floats of wood, cork, and quill.
- Harpoon-floats of bladder, inflated skin, and wood.
- Seine-floats of cork, wood, glass, and rubber-tubing.
- Keg and other floats for lobster-pots, gill-nets, &c.
- Whale-line drag.

29. (ACCESSORY.) ANGLING-APPARATUS, &c.—Continued.

- *h.* Reels:
    - Simple reels for fly-fishing, with and without check.
    - Multiplying reels for bass-fishing, with and without check.
    - Other multiplying reels.
    - Gunwale-winches.
    - Dredge-line rollers.
    - Trawl-line rollers.
    - Seine-windlasses.
- *i.* Line-holders:
    - Winders.
    - Spools.
    - Whaleman's line-tub.
    - Tubs for trawl-lines.
    - Seine-reels.
- *k.* Rods:
    - Straight rods, of cane, wood, whalebone, &c.:
        - Salmon-rods.
        - Trout-rods.
        - Bass-rods.
        - Pickerel-rods.
        - Other rods.
        - Folding-rods.
        - Tips of rubber, whalebone, &c.
        - Tell-tales, used in trolling.
        - Tell-tales for fishing under the ice.
        - (Accessory) cases for rods and rod-tops.
- *l.* Swivels:
    - Box-swivels.
    - Hook-swivels.
    - Pot-gauge swivel.
    - Cod-line swivels.
    - Trawl buoy-rope swivels.
- *m.* Clearing-rings.
- *n.* Disgorgers.

V. NETS.

30. ENTANGLING-NETS.

a. Meshing-nets, (entangling in meshes:)

‡ BARRIER-NETS.

Rabbit-nets, used by Indians of the Southwest.
Bird mesh-nets.
Gill-nets, used in great lakes.

‡ DRIFT-NETS.

† *Those drifting across the tide.*

Shad gill-nets, used in southern rivers.
Bass gill-nets.
Salmon gill-nets.
Mullet gill-nets.

†† *Those drifting along the tide.*

Mackerel gill-nets.
Herring gill-nets.

b. Pocket-nets, (entangling in pockets:)

Trammel-nets.

31. ENCIRCLING-NETS.

a. Seines:

Seal-seines.
Manatee-seines.
Shad-seines.
Mullet-seines.
Menhaden-seines.
Bass-seines.
Blue-fish seines.
Capelin-seines.
Herring-seines
Cod-seines.
Lance-bunts.
Baird collecting-seines.
Bait-seines.
"Fly-tail" seines of North Carolina.

b. Hoop-nets:

Handle, or dip-nets:
  Bull-nets, (worked with ropes and blocks.)

31. ENCIRCLING-NETS—Continued.

- *b.* Hoop-nets:
    - Handle or dip-nets:
        - Scoop-nets, (herring-nets, pound-scoops, car-scoops, &c.)
        - Landing-nets.
        - Eskimo auk-nets.
    - Baited hoop-nets:
        - Crab-nets.
- *c.* Trailing-nets:
    - Trawls:
        - Beam-trawl.
        - (Otter-trawl.)
    - Dredges:
        - Flange, or ordinary dredge.
        - Rake-dredge.
        - Oyster-scraper.
        - (Coral-dredge.)
    - Towing-nets:
        - Surface tow-nets.
- *d.* Folding or jerk nets:
    - Purse-nets:
        - Mackerel purse-seines, (pursed by weight.)
        - Menhaden purse-seines, (pursed by hand-ropes.)
    - Cast-nets:
        - Mullet cast-nets.
        - Pompano cast-nets.
        - Bait cast-nets.
    - Clap-nets for birds.
    - Rabbit-spring nets.
    - Spring-weirs, (St. Lawrence.)
    - Sieve-traps, (for birds.)
- *e.* (Accessory.) Parts of nets and apparatus for manufacture:
    - Raw material of nets.
    - Babiche. (See under D. 20.)
    - Netting-fibre.
    - Netting-twine.
    - Netting-needles.
    - Mesh-needles.
    - Hanging-needles.
    - Eskimo netting-needles.

VI. TRAPS.

32. PEN-TRAPS.

- *a.* Pocket-traps:
  - Pitfalls:
    - Pits, covered.
    - Barrel-traps.
    - Jar mole-traps.
    - "Rabbit-tipe," used in England.
  - Salmon-baskets, (Columbia River.)
  - Salmon-weirs, (Upper Columbia River.)
  - River-weirs, with pockets:
    - Eel-traps.
  - Fish-slides:
    - Shad-slides, used in the rivers of North Carolina.
- *b.* Labyrinth-traps:
  - Corrals.
  - Turkey-traps.
  - Weirs, or pounds:
    - Heart-pound.
    - Salmon-weir.
    - Virginia Indian weir, (figured by DeBry.)
    - Salmon hook-gill-net of the Saint Lawrence.
  - Funnel-traps:
    - Fish-pots.
    - Lobster-pots.
    - Eel-weirs, (with leaders.)
    - Eel-pots, (without leaders.)
    - Barrel-pots, for eels.
    - West India wicker fish-pots.
    - Set-nets.
    - Fykes, (set-nets with leaders.)
    - Bass-traps.
- *c.* Door-traps:

† *Closed by the falling of a door.*

- Box-traps.
  - Rabbit-traps, (figure 4.)
  - Brick traps, (figure 4.)

32. PEN-TRAPS—Continued.
  c. Door-traps:
    Box-traps:
      Musquash traps, with hanging doors.
      Rabbit-traps, for mouth of burrows.
      Self-setting box-traps.
      Double box-traps.
    Spring-door traps.

†† Closed by falling of whole trap.

    Bowl-traps.
    Cob-house bird-traps.
    Pigeon-nets.

††† Closed by falling of tide.

    Bar-weirs.
  d. Sheaf-traps:
    Sheaf-traps, (New York Harbor.)
33. CLUTCHING-TRAPS.
  a. Noose-traps:
    Snares:
      Footpath-snares.
      Barrier-snares.
    Springes.
    "Round mouse-traps."
  b. Jawed traps:
    "Steel traps:"
      Newhouse traps:
        No. 0. Rat-trap.
        No. 1. Muskrat trap.
        No. 1½. Mink-trap.
        No. 2. Fox-trap.
        No. 3. Otter-trap.
        No. 4. Beaver-trap.
        No. 4½. Deer-trap.
        No. 5. Small bear-trap.
        No. 6. Great bear-trap.
    Spring bird-nets.
    (French bird-trap.)

34. FALL-TRAPS.
    - *a.* Crushing-traps:
        - Deadfalls.
        - Figure-four traps.
    - *b.* Piercing-traps:
        - Spear-falls.
        - Mole-traps.
        - Harpoon-traps.
    - *c.* Spring-hooks:
        - Pickerel-hooks.

35. MISSILE-TRAPS.
    - *a.* Cross-bow traps.
    - *b.* Spring-guns.

36. ADHESIVE PREPARATIONS.
    - *a.* Bird-lime, &c.
    - *b.* Hoods, boots, &c.

VII. APPARATUS FOR WHOLESALE DESTRUCTION.

37. POISONS.
    - *a.* Food poisons:
        - Phosphorus poisons.
        - Strychnine.
        - Arsenic.
        - Corrosive sublimate.
        - Cyanide of potassium.
        - Opium poisons.
    - *b.* Blood poison: Woorara

38. ASPHYXIATORS.
    - *a.* Apparatus for smoking-out.
    - *b.* (Apparatus for suffocating with fumes of sulphur.)
    - *c.* Apparatus for drowning-out.

39. TORPEDOES.

39½. STOMACH-SPRINGS.
    - *a.* Eskimo whalebone springs, used in killing bears.

VIII. HUNTING-ANIMALS.

40. HUNTING-MAMMALS.
    - *a.* Dogs.
    - *b.* Hunting-leopard. (*Cynailurus jubatus.*)

40. HUNTING-MAMMALS—Continued.
    - *c.* Weasels and ferrets.
    - *d.* Otters.

41. ACCESSORIES TO HUNTING-DOGS.
    - *a.* Dog-whips.
    - *b.* Dog-whistles.
    - *c.* Dog-collars.
    - *d.* Dog-food.
    - *e.* Dog-carts.
    - *f.* Dog-muzzles.

42. HUNTING-BIRDS.
    - *a.* Falcons.
    - *b.* Owls.
    - *c.* Cormorants, (*Carbo sinensis*, used in fishing in China.)

43. ACCESSORY TO HUNTING-BIRDS.
    - *a.* Hoods.
    - *b.* Perches.
    - *c.* Cormorant-collars.

44. HUNTING-FISHES.
    - *a.* Remora, used in West Indies and Australia.

IX. DECOYS AND DISGUISES.

45. BAITS.
    - *a.* Natural baits:
        - Flies and other insects. (This should include a collection of those insects which, as the favorite food of fishes, are imitated in making artificial flies.)
        - Worms.
        - Mollusks.
        - Salted baits, (prepared.)
        - Menhaden.
        - Herring.
        - Squids.
        - Clams, long.
        - Clams, hen.
        - Pea-roe of cod, (used in French sardine-fisheries, and largely exported.)
        - Grasshopper paste, used as a substitute for pea-roe.
        - Tolling baits, "stosh," &c.

45. BAITS—Continued.
- *a.* Natural baits:
- (Accessory) methods of preparing baits:
  - Bait-cutters.
  - Bait-mills.
  - Bait-ladles.
  - Wheelbarrows for bait-clams, (Nantucket.)
  - Bait boxes and cans.
  - Bait-needles.
- *b.* Artificial baits:
  - Trolling-spoons.
  - Spinners.
  - Squids and jigs.
  - "Bobs," used in southern waters.
  - Artificial flies.
- *c.* Accessory to *b*:
  - *a.* Fly-books.
  - *b.* Raw materials for making artificial flies.
  - *c.* Tools for making artificial flies.
- *d.* Pastes.

46. DECOYS.
- *a.* Scent-decoys.
- *b.* Sound-decoys:
  - Animal calls, whistles, &c.
  - Bird-calls.
- *c.* Sight-decoys:
  - Living decoy animals and birds.
  - Decoy-dogs, used in hunting ducks.
  - Stool-pigeons.
  - Tame decoy-ducks.
  - Tame decoy-brants.
  - Imitations of animals and birds:
    - Decoy swimming-birds.
    - Decoy-waders.
  - Imitations of fishes:
    - Lure-fish used in taking Mackinaw trout.
  - Blanket-decoys, (for antelopes.)
  - Lanterns and other apparatus for fire-hunting and fishing,
  - Lanterns for still-hunting.

46. DECOYS—Continued.
  - *c.* Sight-decoys:
    - Lanterns for weequashing, or fire-fishing, for eels.
    - Jack-lanterns for fishing.

47. COVERS.
  - *a.* Movable covers:
    - Masks:
      - Deer heads and antelope heads.
    - Movable copses.
    - Covers for hunter.
    - Covers for boats.
  - *b.* Stationary covers:
    - Hunting-lodges.

X. PURSUIT, ITS METHODS AND APPLIANCES.

48. METHODS OF TRANSPORTATION.
  - *a.* Personal aids:
    - Snow-shoes.
    - Skates.
    - Alpenstocks and staves.
    - Portable bridges.
  - *b.* Animal equipments:
    - Harness:
      - Horse-trappings.
      - Dog-harness.
      - Girths, sinches.
      - Bits, cabrestos, spurs.
    - Saddles:
      - Riding-saddles.
      - Pack-saddles.
      - Aparejos.
      - Riding-pads, (for buffalo-hunting.)
      - Furpack-saddle, (Hudson's Bay Territory.)
    - Vehicles:
      - Deer-sledges.
      - Dog-sledges.
      - Wagons.
      - Dog-carts.
      - Fish-carts, used in Nantucket.

48. METHODS OF TRANSPORTATION—Continued.

c. Boats:

Hunting-boats, fishing-boats:

- Birch canoes.
- Canoes used by Indians of the northwest coast in whaling.
- Kyaks or bidarkas.
- Umiaks or bidarras.
- Indian raft-boats.
- Launches.
- Dug-outs.
- Portable (paper and canvas) boats.
- Duck-boats.
- Scows.
- Oyster-boats.
- Whale-boats.
- Seine-boats, (sea use.)
- Seine-boats of the lakes.
- Potomac seine-boats.
- Dorys, sharpies, and dingies.
- Pound-boats of the lakes.
- Italian fishing-boats, (California.)
- Pinkies, (Martha's Vineyard.)
- Adirondack boats.
- Alexandria Bay boats.
- Surf-boats.
- Whitehall boats.
- Oyster-canoes.
- Ducking-boats.
- Cat-rigged fishing-boats.
- Mackerel-smacks.
- Oyster-smacks.
- Menhaden-smacks.
- Menhaden-carryaways.
- Bank cod-smacks.
- Smacks with wells, used near the coast.
- Smacks employed in fish-trade.
- Whale-ships.
- Sealers.

48. METHODS OF TRANSPORTATION—Continued.

c. Boats:
- Herring-boats.
- Mackinaw boats. }
- Huron boats. }
- Norwegian boats. }
- Pound-boats. }
  - } Used in the Great Lake fisheries.
- Oyster-pungies, (canoe and square-sterned,) employed on the Chesapeake.
- Oyster police-boats.

Steamers:
- Mackerel-steamers.
- Menhaden steam-mills.
- Lake gill-net steamer.
- Whale-steamers.
- Sealing-steamers, &c.

Accessory to fishing-vessels:
- Rigging, masts, sails, cordage, pulleys, sockets.
- Anchors, killicks, chains.
- Sail-needles, palms, fids, marline-spikes.
- Oar-locks, chocks, oar-rests.
- Stepping-irons for whale-boats.
- Crotches and oar-rests.
- Paddles and oars.
- Rudder-heads, wheels, tillers, &c.
- Fog-horns, trumpets, drums, &c.
- Cabin, blubber-room, cooks' and binnacle lamps and jacket-lamps, signal, binnacle, and common lanterns.
- Compasses, barometers, &c.
- Astronomical instruments, sextants, quadrants, chronometers, hour and log glasses.

49. CAMP-OUTFIT.

a. Shelter:
- Lodges.
- Tents.
- Hunting-camps.
- Hunters' houses.
- Fishing-houses.

49. CAMP-OUTFIT—Continued.

- *b.* Furniture:
  - Hammocks.
  - Beds, couches, stretchers, and lounges.
  - Blankets, rubber and Mackinaw, and fur robes.
  - Fuel.
  - Apparatus for kindling fire.
  - Lamps and lanterns.
  - Tools.
- *c.* Commissary supplies:
  - Cooking-apparatus, kettles, and stoves.
  - Table-furniture.
  - Preserved meats, &c.

50. PERSONAL EQUIPMENTS.

- *a.* Clothing:
  - Hunting-suits.
  - Cloth-suits.
  - Skin-suits.
  - Water-proof suits.
  - Oil-skin suits.
  - Boots, moccasins, leggings.
  - Water-proof boots.
  - Wading boots and stockings.
  - Riding-boots.
  - Moccasins.
  - Leggings.
  - Hats and caps.
  - Protection from insects:
    - Nets for beds and for face.
    - Ointments, (such as tar and sweet-oil.)
    - Smudges, (such as pyrethrum powder.)
    - Shields, breastplates, and defensive armor.
- *b.* Trappings:
  - Belts.
  - Cross-belts.
  - Game-bags.
  - Game and fish baskets and slings.
  - Wallets for lines and other tackle.

50. PERSONAL EQUIPMENTS—Continued.
- *c.* Optical instruments, &c.:
  - Snow-goggles.
  - Telescopes.
  - Field-glasses, &c.
  - Water-telescopes.
- *d.* Medical outfit:
  - Medicine-chests.
  - Hunters' and fishermen's flasks.
- *e.* Artificial lights:
  - Lanterns for camp and ship use.
  - Torches.

SECTION C.

METHODS OF PREPARATION.

I. PREPARATION AND PRESERVATION OF FOOD

1. PRESERVATION DURING LIFE, (see under E, 3.)
2. PRESERVATION OF FRESH MEATS.
    - *a.* Refrigerators:
        - Ice-boxes and refrigerators.
        - Refrigerator-cars.
        - (Accessory.) The ice-trade:
            - Ice cutting and handling apparatus.
            - Methods of manufacturing artificial ice.
            - Ice-houses.
    - *b.* Other accessories of preservation:
        - Meat-hooks.
        - Skewers, &c.
        - Carving-tools.
3. PRESERVATION BY DRYING.
    - *a.* Sun-drying apparatus:
        - Beach dryers.
        - Flake-drying:
            - Newfoundland flakes.
            - Massachusetts flakes.
            - Covers for fish-drying.
    - *b.* Smoke-drying apparatus:
        - Herring smoke-houses.
        - Halibut smoke-houses.
        - Salmon smoke-houses.
        - Sturgeon smoke-houses.
        - Aboriginal drying-houses.
        - Methods of drying haliotis, used by the Indians of California.

4. PRESERVATION BY CANNING AND PICKLING.
   - *a.* Salting fish:
      - Knives, (see under B, 2.)
      - Scaling-apparatus.
      - Tables, tubs, &c.
      - Barrels.
      - (Accessory.) Salt:
         - Specimens of the salts used in preserving fish.
         - Model of salt-mills used on Cape Cod in former days.
   - *b.* Canning meats:
      - Model of salmon-canning establishment.
      - Model of sardine-factory.
      - (Accessory.) Cotton-oil, and its manufacture.
      - Model of lobster-canning factory.
      - Model of oyster-canning factory.

5. PREPARATION OF BAITS.
   - *a.* Bait-mills, knives, choppers, &c., (see under B, 2 and 3.)
   - *b.* Bait tubs, vats, &c.

II. MANUFACTURE OF TEXTILE FABRICS, FELTS, AND STUFFINGS.

6. PREPARATION OF WOOL AND HAIR OF MAMMALS.
   - *a.* Preparation of wool cloths:
      - Washing.
      - Shearing.
      - Stapling or assorting.
      - Scouring.
      - Combing, carding, and plucking.
      - Spinning and reeling.
      - Weaving.
      - Fulling and teazling.
      - Cropping.
      - Pressing.
   - *b.* Weaving worsted cloths.
   - *c.* Felting and the hat manufacture:
      - Bowing.
      - Pressing.
      - Stopping.

6. PREPARATION OF WOOL, &c.—Continued.
    - *c.* Felting and the hat manufacture:
        - Rolling-off.
        - Shaping.
    - *d.* Preparation of curled hair for stuffings.

7. PREPARATION OF WHALEBONE.
    - *a.* Preparation of stuffings.

8. PREPARATION OF FEATHERS.
    - *a.* Preparation of down for stuffings.
    - *b.* Preparation of feather fabrics.
    - *c.* Preparation of "brillantine."
    - *d.* Preparation of or flocking for wall-paper, from refuse quills.
    - *e.* Preparation of fibres for manufacture of plush carpets.

9. PREPARATION OF SILK OF INSECTS.
    - *a.* Preparation of silk of silk-worms:
        - Boiling the cocoons.
        - Reeling.
        - Spinning.
        - Dyeing.
        - Weaving.

10. PREPARATION OF SOFT PARTS OF OTHER INVERTEBRATES.
    - *a.* Preparation of silk from byssus of *Pinna.*
    - *b.* Preparation of sponge stuffing.

III. PREPARATION OF THE SKIN AND ITS APPENDAGES.

11. CURRYING OF LEATHER.
    - *a.* Processes of currying:
        - Dipping.
        - Graining.
        - Scraping.
        - Dressing.
    - *b.* Implements employed by curriers:
        - "Head-knives."
        - "Pommels."
        - "Stretching-irons."
        - "Round-knives."
        - "Cleaners."

11. CURRYING OF LEATHER—Continued.
    - *b.* Implements employed by curriers:
        - "Maces."
        - "Horses," or trestles.
        - "Dressers."
        - "Treading-hurdles."
    - *c.* Eskimo and Indian currying methods and implements.
    - *d.* Methods of dressing gut and sinew.

12. LEATHER-DRESSING.
    - *a.* Processes of tanning leather:
        - Soaking.
        - Liming.
        - Tanning.
    - *b.* Processes of tawing or oil-dressing leather:
        - Soaking.
        - Liming.
        - Oiling.
    - *c.* Apparatus of leather-dressing, recent and aboriginal.

13. FUR-DRESSING.
    - *a.* Processes of fur-dressing:
        - Currying. (See under 12.)
        - Scouring.
        - Tanning.
        - Lustering.
        - Plucking and dyeing.

14. FEATHER-DRESSING.
    - *a.* Method of preparing ornamental feathers:
        - Scouring.
        - Bleaching.
        - Washing.
        - Azuring.
        - Sulphuring.
        - Scraping.
        - Dyeing.
    - *b.* (Art of plumagery.)

15. MANUFACTURE OF QUILL ARTICLES.
    - *a.* Manufacture of quills for pens:
        - Sand-bath drying and steaming.
        - Polishing.

15. MANUFACTURE OF QUILL ARTICLES—Continued.
    - *a.* Manufacture of quills for pens:
        - Dyeing.
        - Shaping.
    - *b.* Manufacture of tooth-picks.
    - *c.* Manufacture of floats and other articles.
    - *d.* Manufacture of quill brush-bristles.
16. HAIR AND WOOL WORK.

IV. PREPARATION OF HARD TISSUES.

17. IVORY CUTTING AND CARVING.
    - *a.* Manufacture of handles, trinkets, billiard-balls, &c.:
        - Turning and sawing.
        - Polishing.
        - Bleaching.
    - *b.* Manufacture of organ and piano keys:
        - Sawing.
        - Strip-sawing.
        - Polishing.
        - Bleaching, &c.
    - *c.* Other processes.
18. PREPARATION OF HORN AND HOOF.
    - *a.* Steaming.
    - *b.* Pressing.
19. PREPARATION OF WHALEBONE.
    - *a.* Cutting and other processes.
    - *b.* Manufacture of whip-makers' stock and whips.
    - *c.* Manufacture of umbrella-maker's bone.
    - *d.* Manufacture of ribbon-weaver's bone.
    - *e.* Manufacture of hat and bonnet maker's bone.
    - *f.* Manufacture of suspender-maker's bone.
    - *g.* Manufacture of stock-maker's bone.
    - *h.* Manufacture of dress and stay maker's bone.
    - *i.* Manufacture of billiard-table cushions.
    - *k.* Manufacture of surgical instruments.
    - *l.* Manufacture of whalebone-brushes.
    - *m.* Manufacture of rosettes, woven-work, and trinkets.
    - *n.* Other whalebone manufactures.
20. PREPARATION OF TORTOISE-SHELL.

21. PREPARATION OF FISH-SCALE WORK.
22. PREPARATION OF NACRE.
23. PREPARATION OF CORAL.
24. PREPARATION OF OTHER HARD TISSUES

V. OILS AND GELATINES.

25. EXTRACTION OF WHALE-OIL, (WITH MODELS OF TRY-WORKS, CLARIFYING-VATS, &c.)
    - *a.* Preparation of body-oil:
        - Cutting in and stowing.
        - Leaning and mincing.
        - Trying.
        - Bailing.
        - Cooling.
        - Barreling.
        - Refining.
    - *b.* Preparation of head-oil.
    - *c.* Preparation of spermaceti.
    - *d.* Instruments and appliances of rendering whale oil:
        - Boarding-knives.
        - Leaning-knives.
        - Mincing-horse and mincing-knives.
        - Mincing-tub.
        - Mincing-machine.
        - Blubber-fork.
        - Try-pots.
        - Fire-pike.
        - Stirring-pole.
        - Scrap-hopper.
        - Skimmer.
        - Bailer.
        - Cooler.
        - Deck-pot.
        - Casks.
26. EXTRACTION OF OTHER MAMMAL OILS.
27. EXTRACTION OF BIRD AND REPTILE OILS.
28. EXTRACTION OF FISH-OILS, (WITH MODELS OF BOILERS, PRESSES, CLARIFYING-VATS, &c.)
29. EXTRACTION OF GLUE, GELATINE, AND ISINGLASS.

VI. DRUGS, PERFUMES, AND CHEMICAL PRODUCTS.

30. MANUFACTURE OF PERFUMES.
31. MANUFACTURE OF IVORY-BLACK.
32. MANUFACTURE OF PRUSSIATES.
33. MANUFACTURE OF MUREXIDES.
34. PREPARATION OF COCHINEAL COLORS.
35. MANUFACTURE OF INKS FROM ANIMAL SUBSTANCES.
36. PREPARATION OF ALBUMEN.
37. MANUFACTURE OF PEPSIN.
38. MANUFACTURE OF PHOSPHORUS.
39. MANUFACTURE OF SAL AMMONIAC.
40. MANUFACTURE OF AMMONIA.
41. MANUFACTURE OF ALBUMEN PREPARATIONS.
42. MANUFACTURE OF PROPYLAMINE.
43. MANUFACTURE OF FORMIC ACID.
44. MANUFACTURE OF CARBAZOTATES.

VII. MANUFACTURE OF FERTILIZERS.

45. PREPARATION OF GUANO.
    - *a.* Model of fish-guano works:
        - Grinders and pulverizers.
        - Mixers.
        - Guano in its various stages, with its ingredients, South Carolina phosphates, Navassa phosphates, scrap, (crude, and dried,) sulphuric acid, kainite, screened and unscreened guano, and sea-weed used in preparation.

VIII. LIMES.

46. BURNING OF LIME.
    - *a.* Models of kilns for burning shells.

IX. PRESERVATION OF THE ANIMAL FOR SCIENTIFIC USES.

47. APPARATUS FOR MAKING AND PRESERVING ALCOHOLIC SPECIMENS.
    - *a.* Tanks and jars:
        - Agassiz collecting-tank.

47. APPARATUS FOR MAKING AND PRESERVING ALCOHOLIC SPECIMENS—Continued.
    - *a.* Tanks and jars:
        - Army collecting-tank.
        - Museum storage-tank, Agassiz model.
        - Anatomical jars.
        - Self-sealing jars, used in collecting.
        - Phials.
        - Tube-phials.
    - *b.* Syringes for injecting.
    - *c.* Inflatable bags.
    - *d.* Preservative mixtures:
        - Alcohol.
        - Glycerine.
        - Carbolic acid.
        - Chloral hydrate.
        - Picric acid.
        - Osmic acid.
    - *e.* Labels:
        - Metallic labels.
        - Parchment labels.
        - Indelible inks, pencils, &c.
48. APPARATUS FOR PRESERVING AND MAKING SKELETONS.
    - *a.* Preparation of the bones:
        - Macerating-vats.
        - Boiling-vats.
        - Cleansing and bleaching preparation.
    - *b.* Mounting of the bones:
        - Scraping-tools.
        - Articulating-tools.
49. APPARATUS FOR MAKING CASTS. MODELING.
    - *a.* Materials:
        - Clays.
        - Plasters.
        - Glues.
        - *Papier-maché* and *carton pierre.*
        - Gelatine.
        - Paraffine.
        - Collodion.

49. APPARATUS FOR MAKING CASTS, &c.—Continued.
    - *b.* Frames and modeling tools.
    - *c.* Molds:
        - Of plaster.
        - Of gelatine.
        - Of paper.
        - Of paraffine.

50. APPARATUS AND METHODS OF MAKING AND MOUNTING SKINS. TAXIDERMY.
    - *a.* Tools:
        - Flaying-tools.
        - Scraping-tools.
        - Taxidermists' tools for stuffing:
            - Forceps.
            - Pliers.
    - *b.* Preservatives and insect-powders:
        - Arsenic and arsenical soap.
        - Corrosive sublimate.
        - Salt, alum, &c.
        - Persian insect-powder.
            - Syringes for application of insect-powder.
        - Tobacco, snuff, used as preservatives.
    - *c.* Frames, &c.:
        - Wooden frames.
        - Wire frames.
        - Plaster model-bodies.

51. (ACCESSORY.) PHOTOGRAPHIC AND OTHER DELINEATING APPARATUS.
    - *a.* Photographic apparatus:
        - Lenses.
        - Cameras and fittings.
        - Camera tripods and stands, with model.
        - Fish Commission stands.
        - Plates, and their results:
            - Wet plates.
            - Dry plates.
            - Dark closets.
    - *b.* Camera obscuras.
    - *c.* Mechanical delineators.
    - *d.* Methods of heliotyping and engraving illustrations.

N

SECTION D.

ANIMAL PRODUCTS AND THEIR APPLICATIONS.

I. FOODS.

1. FOODS IN A FRESH CONDITION.

This section may include specimens of the marketable animals in a fresh condition in refrigerators.

For convenience in making up and arranging this portion of the collection, a list is appended of the animals used as food in the United States. Many others are available, but for various reasons are not commonly eaten.

a. Mammals:

Grizzly bear, (*Ursus horribilis.*)
Black bear, (*Ursus americanus.*)
White bear, (*Thalarctos maritimus.*)
Raccoon, (*Procyon lotor.*)
Buffalo, (*Bison americanus.*)
Musk-ox, (*Ovibos moschatus.*)
Mountain goat, (*Mazama montana.*)
Mountain sheep, (*Ovis montana.*)
Antelope, (*Antilocapra americana.*)
Moose, (*Alces malchis.*)
Woodland caribou, (*Tarandus rangifer*, subsp. *caribou.*)
Barren-ground caribou, (*Tarandus rangifer*, subsp. *grœnlandicus.*)
Elk or wapiti, (*Cervus canadensis.*)
Virginia deer, (*Cariacus virginianus.*)
Mule-deer, (*Cariacus macrotis.*)
Black-tailed deer, (*Cariacus columbianus.*)
Peccary, (*Dicotyles torquatus.*)
Manatee, (*Trichechus manatus.*)
Fox squirrel, (*Sciurus cinereus.*)
Gray squirrel, (*Sciurus carolinensis.*)

1. FOODS IN A FRESH CONDITION—Continued.

a. Mammals:

California gray squirrel, (*Sciurus fossor.*)
Tuft-eared squirrel, (*Sciurus Aberti.*)
Red squirrel, (*Sciurus hudsonius.*)
Flying squirrel, (*Sciuropterus volucella.*)
Woodchuck, (*Arctomys monax.*)
Marmots, (*Arctomys caligatus* and *flaviventer.*)
Polar hare, (*Lepus timidus*, var. *arcticus.*)
Prairie hare, (*Lepus campestris.*)
Northern hare or white rabbit, (*Lepus americanus*, and *L. americanus* var. *virginianus.*)
Red hare, (*Lepus americanus*, var. *Washingtoni.*)
Baird's hair, (*Lepus americanus*, var. *Bairdii.*)
Gray hare or gray rabbit, (*Lepus sylvaticus.*)
Sage rabbit, (*Lepus sylvaticus*, var. *Nuttalli.*)
Audubon's hare, (*Lepus sylvaticus*, var. *Auduboni.*)
Trowbridge's hare, (*Lepus Trowbridgei.*)
Jack rabbit or mule rabbit, (*Lepus callotis.*)
California hare, (*Lepus californicus.*)
Marsh hare, (*Lepus palustris.*)
Water hare, (*Lepus aquaticus.*)
Opossum, (*Didelphys virginiana.*)

b. Birds:

Reed bird or rice bird, (*Dolichonyx oryzivorus.*)
Wild pigeon, (*Ectopistes migratorius.*)
Turkey, (*Meleagris gallopavo.*)
Wild turkey, (*Meleagris gallopavo*, var. *americana.*)
Spruce grouse, (*Tetrao canadensis.*)
Dusky grouse, (*Tetrao obscurus.*)
Sage cock, (*Centrocercus urophasianus.*)
Sharp-tailed grouse, (*Pediœcetes phasianellus.*)
Prairie grouse or prairie hen, (*Cupidonia cupido.*)
Ruffed grouse, (*Bonasa umbellus.*)
Snow ptarmigan, (*Lagopus albus.*)
Rock ptarmigan, (*Lagopus rupestris.*)
White-tailed ptarmigan, (*Lagopus leucurus.*)
Bob-white or "quail," (*Ortyx virginianus.*)
Plumed partridge, (*Oreortyx pictus.*)

1. FOODS IN A FRESH CONDITION—Continued.

b. Birds:

California partridge, (*Lophortyx californicus.*)
Gambel's partridge, (*Lophortyx Gambeli.*)
Scaled partridge, (*Callipepla squamata.*)
Massena partridge, (*Cyrtonyx massena.*)
Black-billed plover, (*Squatarola helvetica.*)
Golden plover, (*Charadrius fulvus* var. *virginicus.*)
Kildeer plover, (*Aegialitis vociferus.*)
Wilson's plover, (*Aegialitis wilsonius.*)
Ringneck plover, (*Aegialitis semipalmatus.*)
Piping plover, (*Aegialitis melodus.*)
Stilt sandpiper, (*Micropalama himantopus.*)
Ruddy plover, (*Calidris arenaria.*)
Woodcock, (*Philohela minor.*)
American snipe, (*Gallinago wilsoni.*)
Red-breasted snipe, (*Macrorhamphus griseus.*)
Willet, (*Totanus semipalmatus.*)
Tell-tale, (*Totanus melanoleucus.*)
Yellow-shanks, (*Totanus flavipes.*)
Upland plover, (*Actiturus bartramius.*)
Long-billed curlew, (*Numenius longirostris.*)
Hudsonian curlew, (*Numenius hudsonicus.*)
Eskimo curlew, (*Numenius borealis.*)
Clapper rail, (*Rallus longirostris.*)
Marsh hen, (*Rallus elegans.*)
Virginia rail, (*Rallus virginianus.*)
Carolina rail, (*Porzana carolina.*)
Yellow rail, (*Porzana noveboracensis.*)
Trumpeter-swan, (*Cygnus buccinator.*)
Whistling swan, (*Cygnus americanus.*)
White-fronted goose, (*Anser albifrons.*)
Snow goose, (*Anser hyperboreus.*)
Brant, (*Branta bernicla.*)
Canada goose, (*Branta canadensis.*)
Mallard, (*Anas boschas.*)
Black duck, (*Anas obscura.*)
Pintail duck, (*Dafila acuta.*)
Gray duck, (*Chaulelasmus streperus.*)

1. FOODS IN A FRESH CONDITION—Continued.

b. Birds:

Widgeon or bald pate, (*Mareca americana.*)
Green-winged teal, (*Querquedula carolinensis.*)
Blue-winged teal, (*Querquedula discors.*)
Red-breasted teal, (*Querquedula cyanoptera.*)
Shoveller, (*Spatula clypeata.*)
Wood duck,(*Aix sponsa.*)
Big black-head, (*Fuligula marila.*)
Little black-head, (*Fuligula affinis.*)
Ring-necked duck, (*Fuligula collaris.*)
Red-head, (*Fuligula ferina*, var. *americana.*)
Canvas-back, (*Fuligula vallisneria.*)
Golden-eye, (*Bucephala clangula.*)
Barrow's golden-eye, (*Bucephala islandica.*)
Butter-ball, (*Bucephala albeola.*)
Long-tail duck, (*Harelda glacialis.*)
Harlequin-duck, (*Histrionicus torquatus.*)
Eider duck, (*Somateria mollissima.*)
King eider, (*Somateria spectabilis.*)
Scoter, (*Œdemia americana.*)
Velvet duck, (*Œdemia fusca*, var. *velvetina.*)
Surf duck, (*Œdemia perspicillata.*)
Long-billed scoter, (*Œdemia perspicillata* var. *Trowbridgei.*)
Ruddy duck or bar duck, (*Erismatura rubida.*)
Sheldrake, (*Mergus merganser.*)
Red-breasted merganser, (*Mergus serrator.*)
Hooded merganser,(*Mergus cucullatus.*)

c. Reptiles:

Gopher tortoise, (*Testudo carolina.*)
Diamond-back terrapin, (*Malacoclemmys palustris.*)
Red-bellied terrapins, (*Pseudemys rugosa.*)
Florida river-terrapin, (*Pseudemys concinna.*)
Alligator turtle, (*Macrochelys lacertina.*)
Snapping turtle,(*Chelydra serpentina.*)
Soft-shell, or leather-back turtle, (*Aspidonectes ferox*, &c.)
Green turtle, (*Chelonia mydas.*)
Pacific green turtle, (*Chelonia virgata.*)
Loggerhead turtle, (*Thalassochelys caouana.*)

1. FOODS IN A FRESH CONDITION—Continued.
    - *d.* Amphibians:
        - Frogs, (*Rana catesbiana, clamitans,* &c.)
    - *e.* Fishes, (eastern coast:)
        - File fish, (*Balistes capriscus.*)
        - American sole, (*Achirus lineatus.*)
        - Flat fish, (*Pseudopleuronectes americanus.*)
        - Smooth flounder, (*Pleuronectes glaber.*)
        - Sand flounder, (*Lophopsetta maculata.*)
        - Flounder, (*Chænopsetta ocellaris.*)
        - Southern flounder, (*Chænopsetta dentata.*)
        - Four-spotted flounder, (*Chænopsetta oblonga.*)
        - Halibut, (*Hippoglossus americanus.*)
        - Newfoundland "Turbot," (*Reinhardtius hippoglossoides.*)
        - Pollack, (*Pollachius carbonarius.*)
        - Cod, (*Gadus morrhua.*)
        - Tom-cod, or frost fish, (*Microgadus tomcodus.*)
        - Haddock, (*Melanogrammus æglefinus.*)
        - Hake, (*Phycis chuss.*)
        - Squirrel hake, (*Phycis tenuis.*)
        - Cusk, (*Brosmius americanus.*)
        - Whiting, (*Merlucius bilinearis.*)
        - Norway haddock, (*Sebastes norvegicus.*)
        - Rose fish, (*Sebastes viviparus.*)
        - Tautog, or black-fish, (*Tautoga onitis.*)
        - Chogset, or cunner, (*Tautogolabrus adspersus.*)
        - Hog fish, (*Lachnolæmus falcatus.*)
        - Angel fish, (*Holacanthus ciliaris.*)
        - Sword fish, (*Xiphias gladius.*)
        - Spear fish, (*Tetrapturus albidus.*)
        - Sail fish, (*Histiophorus americanus.*)
        - Mackerel, (*Scomber scombrus.*)
        - Chub mackerel, (*Scomber colias.*)
        - Bonito, (*Sarda pelamys.*)
        - Horse mackerel, (*Orcynus secundi-dorsalis.*)
        - Spanish mackerel, (*Cybium maculatum.*)
        - Cero, (*Cybium caballa.*)
        - Striped cero, (*Cybium regale.*)
        - Crevallé. (*Carangus hippos* and *Paratractus pisquetus.*)

1. FOODS IN A FRESH CONDITION—Continued.

e. Fishes, (eastern coast:)

- Pompano, (*Trachynotus carolinus.*)
- Short pompano, (*Trachynotus ovatus.*)
- Butter-fish, (*Poronotus triacanthus.*)
- Squeteague, (*Cynoscion regalis.*)
- Spotted squeteague, (*Cynoscion carolinensis.*)
- Drum, (*Pogonias chromis.*)
- Spot, (*Liostomus obliquus.*)
- Silver perch, or yellow-tail, (*Bairdiella punctata.*)
- Red fish, or spotted bass, (*Sciænops ocellatus.*)
- King fish, (*Menticirrus nebulosus.*)
- Southern king fish, or Bermuda whiting, (*Menticirrus alburnus.*)
- Croaker, (*Micropogon undulatus.*)
- Sailor's choice, (*Lagodon rhomboides.*)
- Sheeps-head, (*Archosargus probatocephalus.*)
- Scuppaug, or porgy, (*Stenotomus argyrops.*)
- Grunts, (*Hæmulon arcuatum*, &c.)
- Gray snapper, (*Lutjanus caxis.*)
- Red snapper, (*Lutjanus aya.*)
- Grouper, (*Epinephelus morio.*)
- Spotted grouper, (*Epinephelus guttatus.*)
- Jew fish, (*Promicrops guasa.*)
- Sea bass, (*Centropristis atrarius.*)
- Squirrel, (*Diplectrum fasciculare.*)
- Striped bass or rock fish, (*Roccus lineatus.*)
- White perch, (*Morone americana.*)
- Moon fish, (*Parephippus quadratus* and *P. faber.*)
- Triple-tail, (*Lobotes surinamensis.*)
- Blue fish, (*Pomatomus saltatrix.*)
- Striped mullet, (*Mugil lineatus.*)
- Silver-sides, (*Chirostoma notatum.*)
- Silver gar fish, (*Belone longirostris.*)
- Skipper, (*Scomberesox scutellatus.*)
- Mummichogs, (*Hydrargyra majalis*, &c.)
- Capelin, (*Mallotus villosus.*)
- Smelt, (*Osmerus mordax.*)
- Salmon, (*Salmo salar.*)

1. FOODS IN A FRESH CONDITION—Continued.

e. Fish, (eastern coast:)

- Sea trout, (*Salmo immaculatus.*)
- Tarpum, (*Megalops thrissoides.*)
- Menhaden, (*Brevoortia menhaden.*)
- Shad, (*Alosa sapidissima.*)
- Alewife, or gaspereau, (*Pomolobus pseudoharengus.*)
- Tailor herring, (*Pomolobus mediocris.*)
- Herring, (*Clupea harengus*)
- Mud shad, (*Dorosoma cepedianum.*)
- Anchovy, (*Engraulis vittatus*, &c.)
- Sea eel or conger, (*Conger oceanica.*)
- Eel, (*Anguilla bostoniensis.*)
- Sturgeon, (*Acipenser oxyrhynchus* and *A. brevirostris.*)
- Lamprey eel, (*Petromyzon americanus.*)

f. Fishes, (fresh waters:)

- Burbot or lawyer, (*Lota maculosa.*)
- Fresh-water drum, (*Haploidonotus grunniens.*)
- Small-mouthed black-bass, (*Micropterus salmoides.*)
- Large-mouthed black-bass, (*Micropterus floridanus.*)
- Rock-bass, (*Ambloplites rupestris.*)
- Sacramento "perch," (*Archoplites interruptus.*)
- Sun-fish, (*Pomotis aureus.*)
- Black-eared sunfish, (*Pomotis auritus.*)
- "Bream" of Southern States, (*Calliurus*, *Lepomis*, *Enneacanthus*, *Chœnobryttus*, numerous species.)
- Strawberry or grass bass, (*Hyperistius hexacanthus*, and *Pomoxys storerius.*)
- Yellow perch, (*Perca flavescens.*)
- Yellow pike-perch, (*Stizostedium americanum.*)
- Gray pike-perch or sauger, (*Stizostedium griseum.*)
- Canada pike-perch, (*Stizostedium canadense.*)
- White bass, (*Roccus chrysops.*)
- Short-striped bass, (*Morone interrupta.*)
- Lake pike, (*Esox lucius.*)
- Pickerel, (*Esox reticulatus*, *E. fasciatus*, *E. cypho*, &c., &c.)
- Masquallonge, (*Esox nobilior.*)
- Brook trout, (of eastern slope,) (*Salmo fontinalis.*)
- Brook trout, (of western slope,) (*Salmo iridea.*)

1. FOODS IN A FRESH CONDITION—Continued.

f. Fish, (fresh waters:)

Utah trout, (*Salmo virginalis.*)
Oquassa trout, (*Salmo oquassa.*)
Lake trout, (*Salmo confinis.*)
Salmon trout or Mackinaw trout, (*Salmo namaycush.*)
Siscowet, (*Salmo siscowet.*)
Sebago salmon, (*Salmo sebago.*)
Missouri trout, (*Salmo Lewisi.*)
White fish, (*Coregonus albus.*)
Otsego white fish, (*Coregonus otsego.*)
Lake herring, (*Argyrosomus harengus* and *A. clupeiformis.*)
Black fin of Lake Michigan, (*Argyrosomus nigripinnis.*)
Michigan grayling, (*Thymallus tricolor.*)
Mountain grayling, (*Thymallus montanus.*)
Suckers of eastern slope, (*Catostomus teres*, &c., *Ptychostomus aureolus*, &c.)
Suckers of western slope, (*Catostomus occidentalis*, &c.)
Fall fish, (*Semotilus rhotheus.*)
Chubs of eastern slope, (*Semotilus corporalis*, &c.)
Chubs of western slope, (*Lavinia exilicauda*, *Algansea*, sp., &c.)
"Pike" or "salmon trout" of California, (*Ptychocheilus grandis*, &c., *Pogonichthys inæquilobus*, &c.)
Dace, (*Ceratichthys biguttatus*, &c.)
Buffalo fish, (*Bubalichthys bubalus.*)
Shiner, (*Stilbe americana.*)
Carp, (*Carpiodes cyprinus*, &c.)
Catfishes, (*Amiurus catus*, *A. nigricans*, &c., *Ictalurus cærulesceus*, &c., and many other siluroid fishes.)
Sturgeon of the lakes, (*Acipenser rubicundus.*)
Shovel-nose sturgeon, (*Scaphirhynchops platyrhynchus.*)

g. Fishes, (western coast:)

Flounders, (*Platichthys stellatus*, *Lepidopsetta umbrosa*, &c.)
"Soles," (*Parophrys vetulus*, *Psettichthys melanostictus*, &c.)
Halibut, (*Uropsetta californiana*, *Hippoglossus*, sp., &c.)
Tomcod, (*Microgadus proximus.*)
Cod of Alaska, (*Gadus macrocephalus.*)
Rock fish or "rock cod," (*Sebastomus rosaceus* and species of *Sebastosomus*, *Sebastichthys*, &c.)

1. FOODS IN A FRESH CONDITION—Continued.
   - *g.* Fishes, (western coast:)
     - Rock trout, (*Chirus constellatus.*)
     - "Cod" of San Francisco, (*Ophiodon elongatus.*)
     - Black fish or "sheeps-head," (*Pimelometopon pulcher.*)
     - "Perch," (numerous species of *Embiotoca*, *Holconotus*, &c.)
     - "Bass," (*Atractoscion nobilis.*)
     - Coguard or little bass, (*Genyonemus lineatus.*)
     - San Francisco "smelt," (*Atherinopsis californiensis.*)
     - Pacific smelt, (*Osmerus elongatus.*)
     - Salmon, (*Salmo quinnat*, &c.)
     - Oulachan, (*Thaleichthys pacificus.*)
     - Sardine or pilchard, (*Pomolobus cæruleus.*)
     - Herring, (*Clupea mirabilis.*)
     - Sturgeon, (*Acipenser acutirostris*, &c.)
     - Columbia River sturgeon, (*Acipenser transmontanus.*)
   - *h.* Crustaceans.[1]
   - *i.* Mollusks.[1]

2. FOODS: DRIED AND SMOKED.
   - *a.* Mammal preparations:
     - Jerked bear-meat.
     - Jerked seal and walrus meat, (Indian.)
     - Jerked and smoked buffalo-meat.
     - Dried and smoked beef.
     - Dried and smoked venison.
     - Hams of various kinds.
     - Jerked porpoise-meat, (Indian.)
     - Jerked squirrels and other small mammals.
     - Pemmican.
     - Meat-biscuit, desiccated meat, meat extract, (*extractum carnis*,) desiccated milk, &c.
     - Sausages.
     - Cheese.
   - *b.* Bird preparations:
     - Jerked birds, (Indian.)

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[1] The various applications of these groups are enumerated in the "*List intended to give a general idea of the useful products (other than vertebrates) of the sea and shore, as well as of the interior waters of the United States,*" prepared by Mr. WM. H. DALL, and printed as Circular No. 2 of series (C,) National Museum series.

2. FOODS: DRIED AND SMOKED—Continued.

c. Reptile preparations:

Dried lizards, (Indian.)

d. Fish preparations:

Smoked halibut.

Dried cod, haddock, hake, &c.

Dried and smoked mullet and roes.

Dried and smoked garfish, flying-fish, &c.

Smoked herring, alewives, &c., and their roes.

Smoked salmon, oulachan, white-fish, smelt, &c., and their roes.

Smoked sturgeon.

Veziga, prepared from the notochord of sturgeons.

e. Insects:

Dried grasshoppers, (Indian.)

f. Worms:

Dried worms, (Indian.)

g. Mollusk preparations:

Dried abalones, (*Haliotis*,) prepared by the California Chinese.

Dried siphons of *Schizothœrus* prepared by the Indians of the northwest coast.

Dried slugs, (*Limax*, &c.,) used by Indians.

h. Radiate preparations:

(Dried holothurians, "bêches de mer," used by Chinese.)

i. Protozoans:

("Mountain meal," a kind of infusorial earth, mixed with flour, and used as food in Lapland and China.)

3. FOODS: SALTED, CANNED, AND PICKLED.

a. Mammal preparations:

Salted buffalo-meat.

Salted beef.

Salted deer, reindeer, elk.

Salted tongues of beef, buffalo, deer, horse.

Salted pork.

Canned milk of the various brands.

b. Bird preparations:

Canned turkey.

Canned chicken.

Canned goose.

3. FOODS: SALTED, CANNED, AND PICKLED—Continued.

b. Bird preparations:

(Canned ortolans, (*Emberiza hortularia,*) esteemed a delicacy in Cyprus.)

c. Reptile preparations:

Salted and canned turtles and turtle soup.
Canned frogs.

d. Fish preparations:

Salted halibut, halibuts' fins, &c.
Salted cod, cods' tongues, sounds, and roe.
Salted mackerel.
Salted Spanish mackerel.
Salted bluefish.
Salted pompano.
Salted sword-fish.
Salted mullets.
Salted salmon.
Salted white-fish.
Salted trout.
Salted shad.
Salted herring.
Salted gaspereau.
Salted menhaden.
Salted anchovies.
(Spiced lampreys) used in Europe.
Anchovy-sauce and "essence of anchovies."
Canned menhaden, in oil, "American sardines."
Canned menhaden, in oil, "American club-fish."
Spiced menhaden, "ocean trout."
Canned herring, in oil, "Russian sardines."
Caviare, prepared from roe of the various sturgeons.
(Caviare, prepared from roe carps, used by Jews.)
("Boutargue" or "botargo" prepared on the Mediterranean from the roes of *Labrax* and *Mugil.*)

e. Crustacean preparations:

Canned lobsters.
Canned crabs.
Canned prawns and shrimps.

f. Mollusk preparations:

Canned oysters.

3. FOODS: SALTED, CANNED, AND PICKLED—Continued.
  f. Mollusk preparations:
    Canned clams.
    Canned little-neck clams.
    Canned scollops.
    (Cockles, (*Cardium edule*,) used in Europe as pickles and catsup.)
4. GELATINES.
  a Mammal gelatines, (see also under 24:)
    Gelatines made from tanners refuse and from sinews.
    Gelatines made from feet and hoofs.
    Gelatines made from bone and ivory shavings.
  b. Bird gelatines:
    (Nests of esculent swallows, (*Calocalia esculenta*, *C. fuciphaga*, *C. indifica*, &c.,) exported from Indian Archipelago to China.)
  c. Fish gelatines or isinglass, (see also under 24.)
  d. Insect gelatine:
    Gelatine from cocoons of silk-worms.
5. BAITS AND FOODS FOR ANIMALS.
  a. Prepared baits, (see under B, 45.)
  b. Food for domesticated animals:
    Oil-factory scraps.
    Fish-scraps.
    Cuttle-fish bone, (see under 18.)

II. CLOTHING.

6. FURS, (embracing the furs in their rough state, (*peltries*,) and in the various stages of preparation; also the manufactured articles, such as robes, rugs, cloaks, sacks, tippets, cuffs, muffs, hats, caps, gloves, trimmings and linings.)[1]
  a. Mammal furs:
    (Diana monkey, (*Cercopithecus diana*,) of West Africa.)
    (Black monkey, (*Colobus polycomus*, and other species,) of West Africa—trimmings, &c.)
    (Abyssinian monkey, (*Colobus guereza*.))

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[1] *Note.*—For convenience in arranging the general collections of the museum, this list has been made unusually full, and includes all furs known to be found in American and European markets.

6. FURS—Continued.

a. Mammal furs:

(American howling-monkey, (*Mycetes*, several species)—muffs.)
(Lion, (*Felis leo*,) of Africa and Asia—rugs.)
(Tiger, (*Felis tigris*)—rugs, &c.)
(Leopard, (*Felis pardus*)—rugs and saddle-cloths.)
Puma, (*Felis concolor*)—carriage-robes, rugs, &c.
Ocelot, (*Felis pardalis*)—rugs.
Jaguar, (*Felis onca*)—rugs.
Cat, (*Felis domestica*)—robes and philosophical apparatus.
  Black cat.
  White cat.
  Maltese cat.
  Tortoise-shell.
(Wild-cat, (*Felis catus*,) of Europe and Asia—robes and linings.)
(Snow leopard, (*Felis irbis*,) of Asia.)
Eyra, (*Felis eyra.*)
Yaguarundi, (*Felis yaguarundi.*)
(Cheetah, (*Cynailurus jubatus*,) of India and Southern Asia.)
Bay lynx, (*Lynx rufus*)—rugs, and, when dyed, muffs and boas.
Canada lynx, (*Lynx canadensis*)—rugs and trimmings, and dyed muffs, boas, &c.
Dog, (*Canis familiaris.*)
Eskimo dog.
Wolf, (*Canis lupus*)—linings, rugs, and robes.
  White wolf.
  Black wolf.
  Gray wolf.
  "Blue wolf."
  Red wolf.
Coyote, or prairie wolf, (*Canis latrans*)—rugs and robes.
(Jackal, (*Canis aureus*,) of Old World.)
Red fox, (*Vulpes alopex*, var. *fulvus*)—robes, (mostly imported to Turkey.)
Cross fox, (*Vulpes alopex*, var. *decussatus*)—robes, trimmings.
Black and silver fox, (*Vulpes alopex*, var. *argentatus*)—muffs, cloaks, trimmings; also, fox-skins dyed to imitate lynx; also, various imitations of silver-fox, made from skins of more common varieties.

6. FURS—Continued.

a. Mammal furs:

- Arctic fox, (*Vulpes lagopus.*)
  - White fox.
  - Blue fox.
- Kit fox, (*Vulpes velox*)—robes, muffs, trimmings.
- (Cossac fox, (*Vulpes corsac,*) of Asia.)
- (Mountain fox, (*Vulpes montanus,*) of India.)
- Gray fox, (*Urocyon virginianus*)—rugs, robes, and linings.
- (Spotted hyena, (*Hyæna crocuta,*) of West and South Africa.)
- (Striped hyena, (*Hyæna striata,*) of West Africa and India.)
- Fisher or pekan, (*Mustela Pennanti*)—linings, tails used for trimmings.
- American or Hudson's Bay sable, (*Mustela americana*)—cloaks, muffs, cuffs, boas, linings, &c.:
  - Silver variety.
  - Orange variety.
  - Brown or common variety.
- (Russian sable, (*Mustela zibellina,*) of North Europe and Asia —cloaks, muffs, boas, linings, &c.)
- (Tartar sable, or kolinsky, (*Mustela sibirica*)—cloaks, muffs, and dyed to imitate Russian sable.)
- (Pine marten, (*Mustela abietum,*) of North Europe and Asia.)
- (Stone marten, or French sable, (*Mustela saxorum,*) of Europe—dyed to imitate sable.)
- (Beech marten, (*Mustela foina,*) of Europe and Asia—dyed to imitate sable.)
- (Polecat, fitch, or ferret, (*Putorius vulgaris,*) of Europe and Asia.)
- Ermine, or weasel, (*Putorius erminea,*) of Northern Hemisphere—cloaks, linings, &c.:
  - Royal ermine, trimmed with astrakhan fur, (miniver.)
  - Siberian ermine.
- Long-tailed weasel, (*Putorius longicauda :*)
  - Summer dress.
  - Winter dress.
- Mink, (*Putorius vison,*)—cloaks, muffs.
- Wolverine, (*Gulo luscus,*)—muffs, robes, linings.
- American badger, (*Taxidea americana*)—muffs and rugs.

6. FURS—Continued.

a. Mammal furs:

(European badger, (*Meles vulgaris*)—muffs and rugs.)

Skunk, Alaska sable, (*Mephitis mephitica*)—muffs, boas, &c.

White-backed skunk, (*Conepatus mapurito.*)

Striped skunk, (*Spilogale putorius.*)

Otter, (*Lutra canadensis*,) with specimens of the plucked and dyed fur—muffs, trimmings, &c.

Sea otter, (*Enhydra marina*)—muffs, gloves, collars, cuffs, trimmings.

Black bear, (*Ursus americanus*)—caps, rugs, muffs, robes, &c.

a'. Cinnamon variety.

b. Silvery variety.

(Brown bear, (*Ursus arctos*,) of Europe and Asia.)

Grizzly bear, (*Ursus horribilis*)—rugs, robes, trimmings.

White bear, (*Thalarctos maritimus*)—rugs, robes, and used extensively by the Eskimos.

Raccoon, (*Procyon lotor*)—hats, linings.

Fur-seal, (*Callorhinus ursinus*)—cloaks, hats, gloves, muffs, linings, trimmings, &c.

Cub fur.

(Antarctic fur-seal, (*Arctocephalus aucklandicus*, &c.)

Hair seal, (*Phoca vitulina* and *Phoca Richardsii*)—coats, caps, linings for shoes.

Harp seal, (*Pagophilus grœnlandicus*,) with specimens of the white fur of the unborn cub, and the blue fur of the young.

Hood seal, or bladder-nose, (*Cystophora cristata.*)

Square flipper, or bearded seal, (*Erignathus barbatus*,) with specimens of fur dyed to imitate leopard.

Banded seal, (*Histriophoca equestris*)—used by Eskimos as fur.

Gray seal, (*Pusa gryphus.*)

Ringed seal, (*Pagomys fœtidus.*)

Bison, or buffalo, (*Bison americanus*)—rugs and robes.

a'. Mountain bison.

b. Common bison.

Musk-ox, (*Ovibos moschatus*)—robes, rugs, and trimmings.

(Yak, (*Poëphagus grunniens*,) of Asia—robes and trimmings.)

Mountain goat, (*Aplocerus montanus*)—robes, &c.

6. FURS—Continued.

- *a.* Mammal furs:
  - (Llama, guanaco, paco, and vicugna, (*Auchenia*, sp.)—trimmings, &c.)
  - Goat, (*Capra*, sp.)—rugs, trimmings.
    - *a′.* Angora goat.
    - *b.* Cashmere goat.
    - *c.* Other varieties.
  - Sheep, (*Ovis aries*)—rugs, trimmings, &c.
    - *a.* Astrakhan sheep.
    - *b.* Caracoul sheep.
    - *c.* Other varieties. Lamb-skins and dyed furs.
  - Antelope, (*Antilocapra americana*)—rugs.
  - Moose, (*Alces malchis*)—rugs and robes.
  - Elk, (*Cervus canadensis*)—rugs and robes.
  - Reindeer, (*Tarandus rangifer*)—robes, coats, gloves, &c.
  - Caribou, (*Tarandus rangifer* var.)—robes, coats, gloves.
  - Mule deer, (*Cariacus macrotis*)—trimmings, robes.
  - Virginia deer (*Cariacus virginianus*)—trimmings, robes.
  - Mole, (*Scalops* and *Condylura*, sp.)—robes, garments.
  - (European mole, (*Talpa europæa*)—robes, garments.)
  - Woodchuck, or siffleur, (*Arctomys monax*)—robes, exported to Europe as "white and gray weenusk."
  - Marmot, (*Arctomys caligatus*)—robes, trimmings.
  - Parry's marmot, (*Spermophilus Parryi*)—robes, trimmings.
  - Gray squirrel, (*Sciurus carolinensis*, &c.)—trimming; tails used for boas.
  - (Squirrel, or "calabar," (*Sciurus vulgaris*,) Northern Europe and Asia.)
    - *a′.* Siberian squirrel. Trimmings, muffs, capes, &c.; tails used for boas, dyed to imitate sable.
    - *b.* "Weisenfels linings" of the white fur of the belly.
  - Showt'l, (*Haplodontia leporina*)—used by Indians.
  - (Chinchilla, (*Chinchilla laniger.*) of South America—muffs, mantles, boas, cloak-linings, and trimmings.)
  - Musquash, (*Fiber zibethicus*)—muffs, capes, caps, and linings, and imitations of beaver-fur.
  - (Neutria, or Coypu, (*Myopotamus coypus*)—linings and muffs, and imitations of beaver.)

6. FURS—Continued.
  a. Mammal furs:
    (Beaver, (*Castor fiber*,) of Northern Europe and Asia.)
    Beaver, (*Castor canadensis*)—linings and muffs.
      White beaver.
      Spotted beaver.
    Rats and mice, (*Mus.*, sp. var.)
    Lemming, (*Myodes torquatus* and *obensis*)—robes.
    Rabbit, or cony, (*Lepus cuniculus*)—children's furs, and imitations of seal, beaver, &c., exported largely to China.
        White variety.
        Blue variety.
        Brown variety.
    American native rabbit furs, such as *Lepus glacialis*, used for muffs, boas, and feltings.
    Possum, (*Didelphys virginiana.*)
    (Kangaroo, (*Macropus giganteus*,) of Australia.)
    (Ornithorhynchus, (*Ornithorhynchus anatinus*,) of Australia.)
  b. Skins of birds used as furs:
    Turkey furs, (*Melagris gallopavo*, &c.)
    Gull furs, (*Larus argentatus*, &c.)
    Grebe furs, (*Podiceps aristatus*, &c.)
    Loon furs, (*Colymbus torquatus*, &c.)
    Swan furs and swan's down trimmings, (*Cygnus americanus*, &c.)
    Pelican furs, (*Pelecanus fuscus*, &c.)
    Adjutant crane, (*Ciconia argala*)—feathers used as fur.
    Puffin furs, (*Fratercula arctica*, &c.)
    Penguin furs, (*Aptenodytes*, *Pennantii*, &c.)
    Feathers of common fowl used in trimmings.

7. LEATHERS. (See under 20.)

8. TEXTILE FABRICS.
  a. Prepared from hair of mammals:
    Human hair used in manufacture of watch-chains.
    Hair of bats used in felting and in plaiting ropes in Central America and tassels in New Caledonia.
    Hair of raccoon used in felting, (largely exported to Germany for the use of hatters.)
    Hair of weasels and sables used in felting.

8. TEXTILE FABRICS—Continued.

a. Preparations of hair of mammals:

Hair of fur seal woven with silk in the manufacture of shawls.

Moose hair and its fabrics.

Ox and calf hair used in the manufacture of imitation woolen goods.

Sheep's wool, with specimens of fleeces and stapled wools, from various breeds and localities, short-wool fabrics, broadcloths, merinoes, flannels, mouselins de laine, serges, tweeds, blankets, carpets, and tartans, worsted fabrics, stuffs, bombazines, camlets, shawls, plushes and velvets, hosiery, and yarns, felts, felt-cloths, and felt-hats.

Goats' wool with specimens of mohairs, cashmeres, plushes, velveteens, camlets, and shawls. (For manufactured wigs and perukes, see under 21.)

(Yak (*Poëphagus grunniens*) wool with specimens of yak-lace and other fabrics.)

(Camels' hair with specimens of fabrics, plushes, felts, shawls, &c.)

(Hair of llama, paco, guanaco, and vicugna, with specimens of alpaca, guanaco, and other fabrics, and umbrellas and other articles manufactured.)

Hair of horses used in weaving furniture-covers, crinoline-skirts, and bags for pressing oil.

Hair of buffalo used in plaiting ropes, lariats, &c.

Fur of mole used in felting.

Beaver (castor) fur with specimens of the felt cloths, hats, &c.

(Neutria-fur used in felting and in the manufacture of hats.)

Musquash fur used in felting.

Possum hair with fabrics of Indian and other manufacture.

Fur of rabbit and hare used in felting, with specimens of hats and cloths.

Whalebone fiber used in weaving cloth covers for telescopes, &c.

b. Prepared from feathers of birds:

Cloths woven from feathers, (China.)

c. Prepared from silk of insects: (This collection should include specimens of the cocoons, the raw silk, the spun silk, and of the various fabrics, plain and figured silks, satins and satinettes, shawls, damasks, brocades, crapes, and ribbons.)

8. TEXTILE FABRICS—Continued.

c. Prepared from silk of insects:

Silk of common silk-worm, (*Bombyx mori.*)

Silk of *Samia cecropia*, *Samia polyphemus*, and other native American moths.

(Silk of exotic moths other than *Bombyx mori*, such as the tussah, (*Bombyx pernyi* and *Bombyx mylitta*,) the moonga, (*Saturnia assamensis*,) the joree, (*Bombyx religiosa*,) the ena or arindy, (*Bombyx cynthia.*))

Fabrics woven by the insects themselves, as *Tinea padilla.*

Silk of spiders.

d. Prepared from byssus of mollusks.

(Fabrics woven from byssus of the wing-shell (*Pinna nobilis*) and other mollusks.)

III. MATERIALS EMPLOYED IN THE ARTS AND MANUFACTURES.

* *Hard materials.*

9. IVORY AND BONE. (This collection should include specimens of the various ivories and bones in their rough state, and manufactured into buttons, trinkets, cutlery-handles, canes, pen and pencil handles, brush-handles, billiard and bagatelle balls, dice, piano-keys, harness-rings, combs, false-teeth, philosophical instruments, and as used by portrait painters and photographers.)

a. Ivory of mammals:

Tusks of walrus used for trinkets, handles, jewelry, buttons, paper-knives, counters, &c.

Teeth of bears, dogs, wolves, foxes, peccaries, and other large mammals, used as implements, arrow-tips, and ornaments, by Indians.

Elk-ivory used by Indians in ornamentation.

Tusks of mammoth elephant (*Elephas primigenius*) from northern America and Asia, with Eskimo carvings and specimens of "Siberian ivory."

9. IVORY AND BONE—Continued.

a. Ivory of mammals:

(Tusks of African elephant with specimens of sawed and scroll ivory and of the manufactured balls, combs, piano-keys, handles, rings, canes, buttons, trinkets, bangles, and miniature tablets.)

(Tusks of the Asiatic elephant and their applications.)

(Teeth of hippopotamus as used for handles for surgical instruments, index-fingers, and formerly for false-teeth, (trade-name, "sea-horse.")

Teeth of wild-hog used in manufacture of jewelry, vinaigrettes, &c.

Teeth of peccary.

Ivory of narwhal used for canes.

Teeth of sperm-whale and their application to the manufacture of balls, buttons, and trinkets.

Incisors of beaver used by Indians for chisels, knives, and ornaments.

b. Ivory of reptiles:

Teeth of alligator used for jewelry, whistles, cane-handles, buttons, &c.

c. Ivory of fishes:

Sharks' teeth used in arming weapons.

Teeth of sharks and other fish used as trinkets.

Jaws of the sleeper-shark (*Somniosus brevipinna*) used for head-dresses by Indians.

d. Bone of mammals:

Parts of splanchno-skeleton of ferae, used as charms.

Bones of bear and other large mammals, used by Indians for implements, and as tablets for paintings.

Bones of buffalo and of the domestic ruminants, used as substitute for ivory in the manufacture of buttons, handles, combs, &c.

Sperm-whale jaw-bone, used for harness-rings, martingales, &c.

Horn-cores of ruminants, used in manufacture of assayers' cupels.

e. Bone of birds:

Bones of birds, used by Indians and Eskimos in making awls, needles, flutes, bird-calls, and dress-trimmings.

9. IVORY AND BONE—Continued.

f. Bone of fishes:

Fish-bones, used by Indians and Eskimo in making implements.

Shark's vertebræ, used for canes.

Bones of sharks and skates, used (in Japan) in making imitation tortoise-shell.

g. Waste bone and ivory:

Use in manufacture of bone-black, ivory-black, and bank-note ink, (see under 29.)

Use in manufacture of sizes and glues, (see under 24.)

Use in manufacture or gelatine for food, (see under 4.)

Use in manufacture of phosphorus, carbonate of ammonia, (hartshorn,) and sal ammoniac, (see under 30.)

Use in manufacture of bone-charcoal for filters, (see under 30.)

Use in manufacture of paper.

Use of shavings in case-hardening gun-barrels and other fine steel.

10. HORN. (Embracing the varieties of horn known to commerce, the split and pressed horns, and the various manufactured articles, such as jewelry, combs, and handles.

a. Horn, employed as a material:

Horn of rhinoceros, used for handles and trinkets, cups, boxes, whips, and canes.

Horns of ox, sheep, and goat, used for handles, buttons, combs, powder-flasks, cups, boxes, stirrups, spoons, and imitations of tortoise-shell, also "sensitive Chinese leaves," and formerly for transparent plates in lanterns and horn-hooks, for trumpets, and for finger-nails in lay figures.

Horn of buffalo, used like that of ox.

(Horn of Asiatic buffalo, (*Bos bubalus.*))

Horn of mountain-sheep and mountain-goat, used by Aleutians, in making spoons, bowls, and numerous other implements.

b. Antlers:

Antlers of deer, elk, and moose, (stag-horn,) used in the manufacture of handles for instruments, trinkets, and buttons.

10. HORN—Continued.

b. Autlers:

Antlers of deer, elk, moose, and nearly all species of ruminants, employed for ornamental purposes.

c. Chemical and other applications:

Burnt horn, (*cornu ustum*,) used in dentifrices.

Carbonate of ammonia, (hartshorn,) manufactured from deer-horns, (see under 30.)

11. HOOFS AND CLAWS, &c. (Embracing the commercial hoof, and the various stages of manufacture represented by specimens.)

a. Hoofs:

Hoofs of ox and bison, used in making buttons, combs, and handles.

Hoofs of horse, used like those of ox and bison.

Hoofs of musk-ox, deer, and antelope, used by Indians in ornamentation.

Feet of deer, used for knife-handles, stool-feet, &c.

b. Claws:

Claws of bear, puma, wolf, &c., used by Indians in ornamentation.

(Claws of lion and tiger, used by jewelers for trinkets.)

Human nails, used by Indians for ornamental trimmings.

c. Chemical applications of hoofs and claws:

Use in manufacture of prussiate of potash, (see under 30.)

Use in manufacture of glue, (see under 24.)

12. BALEEN. (Embracing the commercial baleen in its various grades, *Greenland*, *Northwest Coast*, *South Sea*, *fin-back*, and *hump-back*, with the split, twisted, and dyed bone.)

a. Whalebone, as used by manufacturers of ribbons, hats, umbrellas, whips, canes, boots, fishing-rods, billiard-tables, buttons, handles, brushes, surgical instruments, stays, corsets, crinolines, harness-rosettes, covers, stuffings, light woven hats and bonnets, &c.; also, imitation whalebone, (wallosin,) made from rattan.

13. TORTOISE-SHELL. (Embracing the carapace entire, and the commercial shell, *blades*, *feet*, *noses*, and *head*.)

13. TORTOISE-SHELL—Continued.

a. Shell of tortoise (*Eretmochelys imbricata*, *E. squamata*) used in manufacture of combs, handles, jewelry, inlaying, and buttons, together with imitations of tortoise-shell in horn, shark's bone, and celluloid.

b. Shells of land tortoises, used by Indians for pots, scoops, and rattles.

14. SCALES.

a. Shell of mammals:

Shell of armadillo, used by Texans and Mexicans.

b. Scales of fishes used in ornamental work, with specimens of flowers and other articles manufactured:

Scales of parrot fishes, (*Scaridæ* and *Labridæ*.)

Scales of mullets, (*Mugilidæ*.)

Scales of sheepshead, &c., (*Sparidæ*.)

Scales of drum and bass, (*Sciaenidæ*.)

Scales of Serranidæ and perches, (*Percidae* and *Labracidæ*.)

Scales of Lobotidæ.

Scales of tarpum, (*Elopidæ*.)

Scales of herrings, (*Clupeidæ*.)

Scales of Cyprinidæ.

Scales of eels, used in the north of Europe to give a pearly luster in ornamental house-painting.

Scales of gar-pikes, used by Indians for arrow-tips.

(Pearl white, or *essence d'Orient*, prepared from scales of *Alburnus lucidus* and other Cyprinidæ and Clupeidæ, used in making artificial pearls.) (See under 27.)

Shagreen of trigger-fish, (*Balistes*,) used in polishing wood.

Shagreen of sharks, used as leather, (see under II, B. 5,) and for polishing purposes, particularly in the manufacture of quill pens.

Scales of sturgeons, used by Indians for implements.

For gelatine as a material and the arts and papier glacé, see 24.

15. PEARL.

a. Pearls and nacre, (embracing the pearl-yielding shells, with the pearls and the mother-o'-pearl in the rough state, with the manufactured buttons, handles, and jewelry, pearl-powder, inlaid work, and papier maché, ornamented with mother-o'-pearl:)

15. PEARL—Continued.

a. Pearls and nacre:

Top-shells, (*Turbinidæ*,) and their application to manufacture of shell-flowers.

Tower-shells, (*Trochidæ.*)

Ear-shells, (*Haliotidæ*,) used in manufacture of buttons, handles, inlaid work, and pearl-powder.

Other gastropods supplying nacre.

Pearl-oysters, (*Aviculidæ*,) with pearls and nacre.

River-mussels, (*Unionidæ*,) with pearls and nacre.

Mussels, oysters, and other conchifers supplying pearls and nacre.

Shells of nautilus and argonaut, prepared to exhibit their nacre.

Ornamental pearl-work, imitating sprays of flowers, &c.

Imitation pearls.

16. SHELL.

a. Cameo shell:

Shell of conch, (*Strombus gigas*,) and carvings.

Shell of helmet, (*Cassis rufa*, *C. tuberosa*, and *C. madagascariensis*,) with carvings.

b. Shells used for implements, &c.:

Shells of *Strombus*, *Triton*, *Dolium*, *Fusus*, *Murex*, and *Buccinum*, used for fog-horns, lamps, vases, and ornamental borders in flower-gardens.

Shells of *Busycon*, *Sycotypus*, *Mactra*, &c., used by Indians in manufacture of implements, with specimens of implements.

Shells of *Mactra*, used for ladles, scoops, and spoons by fishermen.

Shells of *Tridacna*, used for vases, fountains, and in the manufacture of handles and carvings.

Shells of *Pecten*, *Haliotis*, *Dentalium*, *Mercenaria*, &c., used by Indians for trimmings and ornaments.

(Scallop, or palmer's shell, (*Pecten jacobæus*,) used as a decoration of honor.)

(Chank shell, (*Turbinella pyrum*,) used in the manufacture of Hindoo bangles, and in polishing cloth.)

Shells of *Pecten*, used in making pin-cushions and purses.

16. SHELL—Continued.

b. Shells used for implements, &c.:

(Painters' mussel, (*Unio pictorum*,) used to hold colors.)

(Shells of *Placuna placenta*, used in China as a substitute for window-glass.)

Shells of *Mercenaria violacea*, *Purpura lapillus*, and *Buccinum undatum*, used by Indians of eastern coast in manufacture of money, with specimens of wampum, (with the modern wampum or shell beads manufactured for the Indian trade,) and of the hyqua or *Dentalium* shells, employed in a similar manner by the Indians of the Pacific coast.

Specimens of the cowry, (*Cypraea moneta*.) "Live cowry" and dead cowry, used in African trade and for trimmings.

Shells of *Cypraea*, *Rotella*, *Oliva*, *Turritella*, *Phasianella*, (Venetian shells,) &c., mounted as buttons and jewelry.

Composition shell-work for box-covers and frames, made by glueing shells in mosaics.

Calcined shells, used by dentifrice and porcelain makers. (See, also, under 32.)

Cuttle-fish bone from *Sepia officinalis*, used as a pounce, as a dentifrice, as polishing-powders, for taking fine impressions in counterfeiting, and as food for birds. (See, also, under D. 5.)

Concretions from the stomach of *Astacus*, known as "crab's-eyes" and "crab-stones," and used as antacids.

Shell of king-crab, (*Limulus polyphemus*,) used as a boat-bailer.

Opercula of mollusks, used as "eye-stones."

17. CORAL.

a. Coral as a material:

Red coral, (*Corallium nobilis*,) with specimens of the five commercial grades (1, froth of blood; 2, flower of blood; 3, 4, 5, blood of first, second, and third qualities) of the white variety, and of the round beads, negligée beads, bracelets, pins, coronets, armlets, and earrings, &c.

White coral, *Oculina*, sp., used by jewelers.

Madrepores and other showy corals, used for ornamental purposes.

Horny axis of black flexible coral, (*Plexaura crassa*,) used for canes and whips in the Bermudas.

17. CORAL—Continued.

a. Coral as a material:

- Axis of fan coral, (*Rhipidogorgia*,) used for skimmers and strainers in the Bermudas.
- Coral, used for building purposes.
- Coral rock of recent formation, (Coquina,) used in Florida in manufacture of ornamental vases and carvings.
- Calcined coral, used for dentifrices, as an antacid, &c.
- Imitations of red coral in celluloid, rubber, and other substances.

18. INFUSORIAL EARTHS.

a. Polishing powders, (used for polishing metals, cabinet-ware, and stone:)

- Specimens of polishing-slate, tripoli, and other foreign polishing-powder.
- Specimens of American infusorial deposits.

b. Infusorial earths, employed in manufactures:

- Infusorial earth, used in making window and plate glass.
- Infusorial earth, used in making soluble glass.
- Infusorial earth, used in making mortar.
- Infusorial earth, used in making molds for metal casting.
- Infusorial earth, used in making filters.
- Infusorial earth, used in making dynamite.
- Infusorial earth, used in making fire-proof packing.
- Infusorial earth, as an absorbent for oils and liquids.

19. OTHER MATERIALS FROM INVERTEBRATES.

a. From insects:

- Brazilian diamond-beetles, used in jewelry.
- Wings of beetles, used in embroidery.

b. From echinoderms:

- Spines of echinoids, used for slate-crayons.

** *Flexible materials.*

20. LEATHERS. (Embracing the hides in a rough state, in the various stages of dressing, and manufactured into shoe-leather, parchment, vellum, binder's leather, thongs, &c.)

a. Prepared from mammal skins:

- Cat-leather.
- Dog and wolf leather, used for drum-heads, &c.

20. LEATHERS—Continued.

a. Prepared from mammal skins:

Bear-leather.

Raccoon-leather, used for gloves and upper-leathers of shoes.

Seal-leather, used for fine shoes and in the manufacture of "patent leather," and by Eskimos for numerous purposes.

Sea-lion leather, used by Eskimos to cover bidarkas and for garments and beds.

Walrus-leather, used by Eskimos for harness, tables, thongs, seal-nets and for covering polishing wheels.

Bison-leather (and buffalo-leather, buff-leather.)

Ox-leather, with specimens of sole-leather, split-leather, grain-leather, rawhide thongs, whips, leather-belts and saddles, and of calf-skins, prepared for binders' and boot-makers' use, as Russia leather and vellum, and tawed, as parchment.

Sheep-leather, with specimens of binder's leather, imitation chamois leather, wash-leather, buff-leather, roan, imitation morocco and parchment, with vellum made from skins of dead-born lambs, and manufactured gloves, &c.

Goat-leather, with specimens of shagreen-leather, morocco-leather, as used for linings, upholstery, bindings, and pocket-books, parchment, drum-heads, &c., with kid-leather, used in manufacture of shoes and gloves, under-clothing, and vellum made from skin of young kids, also skin-bottles used in Asia.

Horse and ass leather, used in manufacture of shagreen, sole-leather, harness-leather, saddles, trunks, water-hose, pump-valves, military accoutrements, ladies' shoe-uppers.

(Chamois leather, (*Capella rupicapra*,) used for polishing purposes and for straining mercury.)

(Leather of gazelle, (*Gazella dorcas*,) used in packing commercial aloes, and of African antelopes, used in packing elephants' tusks.)

Deer-leather, dressed as buff-leather, chamois-imitation leather, Indian dressed (buckskin,) and for the finer moroccos, also manufactured into gloves, gaiters, undergarments, polishers, &c.

Moose-leather in ordinary and buckskin finish.

20. LEATHERS—Continued.

a. Prepared from mammal skins:

Caribou-leather in ordinary and buckskin finish.

(Reindeer-leather.)

Elk-leather in ordinary and buckskin finish.

Antelope-leather in plain, buckskin, and oil-finish, used in manufacture of castor-gloves.

Peccary-leather as used in the manufacture of gloves.

Hog-leather used by saddlers, shoemakers, and book-binders.

Hippopotamus-leather used for buffing or polishing wheels.

Rhinoceros-hide used for shields, targets, whips, &c.

Beluga leather dressed as kid, sole, harness, velvet, plush, boot, mail-bags, belts, and patent (varnished) leather.

Porpoise-leather.

Beaver-leather used in manufacture of saddles, shoes, gloves, and trunks.

(Nutria-leather (*Myopotamus coypus*) of South America.)

Rat-leather used for thumbs of kid gloves.

(Kangaroo-leather.)

Leather trimmings used as stuffing for balls, &c.

b. Prepared from intestines of mammals:

Parchment from viscera of seals, used by Eskimo for clothing, bags, and blankets.

Leather from pharynx of seal and walrus used by Eskimo for boot-soles.

Parchment from viscera of bears used in Kamtchatka for masks and window-panes.

Viscera of ox used in manufacture of gold-beaters' skin.

Bladders of animals used for pouches, parchment, bottle and jar covers, and by Eskimo for oil-bottles.

Viscera of sheep used in manufacture of "cat-gut," with specimens of whip-cord, hatters' cord, for bowstrings, clock-makers' cord, filandre, guitar, violin, and harp strings, angling-lines, &c.

Viscera of hog used as envelopes for minced meat, sausages, &c.

Sinews of sheep, deer, goat, buffalo, seal, walrus, and other animals used in manufactures of threads, lines, nets, and snow-shoes, in strengthening bows, &c., the Babiche of the Eskimos of the northwest coast.

20. LEATHERS—Continued.
- *c.* Prepared from bird-skins: (Eskimos.)
    - Eider-leather.
    - Auk-leather.
    - (Ostrich-leather used by Arabians.)
- *d.* Prepared from reptile skins:
    - Alligator-leather.
    - Rattlesnake-leather.
    - Other snake-leather.
- *e.* Prepared from fish-skins:
    - Leather prepared from scaled fish by Indians.
    - Eel-leather, (pigtails, queues, flail-thongs.)
    - Shark-leather, (shagreen used for coverings and by the Alaska Indians for boot-soles.)
    - Sturgeon-leather.
    - (Skins of *Diodon* used in making helmets.)
    - Stomach membranes of halibut used in Greenland for window-transparencies.
- *f.* Leather waste:
    - Paper manufactured from waste.
    - Glue manufactured from waste, (see under 24.)
    - Prussian blue made from leather waste, (see under 30.)

21. HAIR AND WOOL.
- *a.* Hair used in weaving and felting, (see under 8.)
- *b.* Hair used for wigs and ornament:
    - Human hair as an article of commerce, with specimens of switches and wigs, and also of the trade imitations of hair in jute, horse-hair, &c.
    - Goats' wool as employed in manufacture of wigs and perukes.
    - Horse-hair employed for military accoutrements and for standards, (Turkey.)
    - Human scalp-locks as Indian trophies.
    - Scalps of animals as trophies.
- *c.* Hair and bristles used for brushes, (embracing the commercial hair and bristles, assorted and unassorted, and specimens of the manufactured articles:)
    - Hair of skunk used for fine brushes.
    - Hair of bear used for varnishing-brushes.

21. HAIR AND WOOL—Continued.

c. Hair and bristles used for brushes:

Hair of American badger used for fine shaving, graining, gilding, and dust brushes.

(Hair of European badger used for coarse brushes.)

Hair of dog used for coarse pencil-brushes.

Hair of squirrel, marten, sable, kolinsky, and weasel, especially the tails, used in making fine artists' pencils.

(Hair of camel used for pencils.)

Bristles of hog and peccary used in making coarse brushes for varnishing, scrubbing, &c.

Tails of horses, buffaloes, &c., used for fly-brushes.

(Tails of yak used for fly-brushes.)

(Tails of elephants used for brushes and standards.)

Sheep's wool (on skin) used for black-board rubbers.

Hair of deer and antelope (on skin) used by Indians for hair-brushes.

Ox-hair from the inside of cows' ears used for striping and lettering brushes.

d. Hair used in other manufactures:

Bristles used in shoemakers' waxed ends.

Bristles used in anatomical instruments.

Hair and bristles used in artificial flies. (See under B, 45.)

Hair of cattle used in strengthening mortar and plaster.

e. Hair used for stuffing:

Horse-hair, straight and curled, used for mattresses and cushions.

Refuse hair of beaver and musquash, cut from felting-hair, used for cushions.

(Down of rabbits used for cushions.)

f. Wool used as a medium for pigments:

Wool flocking used in the manufacture of wall-paper, colored felts, and rubber-cloth.

g. Chemical products:

Refuse human and other hair used in manufacture of prussiate of potash, with specimens of manufactured product.

22. QUILLS.

a. Quills of mammals:

Quills of American hedge-hog used by Indians in embroidering.

22. QUILLS—Continued.

a. Quills of mammals:

(Quills of porcupine used for pen-holders, floats for fishing, eyelet-punches, &c.)

(Quills of European hedge-hog, on skin, used as a muzzle for weaning calves.)

b. Quills of birds:

Quills of swan and turkey for engrossing-pens.

Quills of goose and eagle for writing-pens.

Quills of crow and duck for fine pens.

Quills used in making toothpicks, fishing-floats, color-bottles, pencil-handles, needle-holders, &c.

23. FEATHERS.

a. Feathers used for clothing. (See under Furs, D 6.)

b. Feathers used for implements, (including manufactured articles:)

Feathers of hawks used as fans and screens.

Feathers of fowl, turkey, grouse, and peacock used for brushes, fans, and screens.

Feathers of ibis, spoonbill, egret, and bittern used for fans and screens.

Feathers of flamingoes, swans, geese, and ducks used for fans and screens.

c. Feathers used for plumes and ornament, (including plumes, head-dresses, cockades, hat and dress trimming, &c.:)

Feathers and wings of small perchers used in millinery and in manufacture of feather flowers.

Feathers of trogons and birds of paradise used as plumes and for feather flowers.

Feathers of humming-birds, scalps, and throats used in ornamental work.

Feathers of kingfishers used in plumagery.

(Feathers of parrots used in making feather flowers.)

Eagle and hawk feathers used for plumes.

Feathers of pigeons used for ornamental work.

Feathers and wings of cock used as plumes, trimmings, &c., natural and dyed.

Breast feathers of grouse, pheasants, and turkeys used as roll-plumes in hats.

23. FEATHERS—Continued.

c. Feathers used for plumes, &c.:

Feathers of ibises, spoonbills, flamingoes, herons, egrets, and bitterns used for plumes and ornamental work.

(Feathers of adjutant, (*Lepoptilus argala*,) and marabou, (*Lepoptilus marabou*,) used for plumes and trimmings.)

Feathers of flamingoes, swans, geese, and ducks used in ornamental work for roll-plumes, and swans' down for trimmings. (See under 6.)

Breast-feathers of gulls, terns, and tropic birds used as roll-plumes.

(Feathers of African ostrich used for plumes and trimmings, with specimens of undressed, scoured, bleached, scraped, and dyed grades.)

Feathers of American ostrich.

Specimens of composite feather flowers.

Specimens of plumagery work on metal.

Specimens of birds mounted for use in millinery.

d. Feathers used in other manufactures:

Feathered arrow-shafts. (See under B, 18.)

Feathers used in making artificial flies. (See under B, 45.)

Feathers used in manufacture of textile fabrics. (See under D, II, C.)

e. Down of birds:

Down of eider-duck used in bed-stuffing, with specimens of the balls in which it is packed for transportation.

Down of other ducks.

Down of geese and swans used as stuffing for beds, and as electrical non-conductor in manufacture of philosophical instruments.

24. GELATINE AND ISINGLASS.

a. Gelatine:

Gelatine made from leather-shavings, bones, hoofs, and horns of bison, cattle, sheep, and other domestic animals, used in manufacture of glue, size, court-plaster, *papier glacé* for tracing, imitation glass, artificial flowers, and ornamental work, wrappings for confections, table-jelly, (see under D. 1,) &c.

Size and gelatine from fine ivory chips.

24. GELATINE AND ISINGLASS—Continued.

a. Gelatine:

Bone-glue, (Osteocolla.)

(Glue made in India from skin of the ass, (Hippocolla.))

b. Isinglass:

Isinglass, (Ichthyocolla,) made from air-bladders and skins of fishes and used in the manufacture of fine glues and sizes, adhesive and court plasters, diamond cement, imitation glass, and table-jelly and confectionery, (see under D. 1, D,) in refining wines and liquors, in adulterating milk, in fixing the luster of artificial pearls, and in lustering silk ribbons, (embracing the dried bladders and the manufactured products,) in their grades of "lyre," "heart-shaped," "leaf," and "book" isinglass.

Isinglass from sounds of cod and hake.

Isinglass from the squeteague family, (*Sciænidae*,) principally used by confectioners.

Isinglass from cat-fish family, (*Siluridae.*)

Isinglass from carp family, (*Cyprinidae.*)

Isinglass from sturgeons in all its grades and commercial forms.

Isinglass prepared from fish-skins.

25. FLEXIBLE MATERIALS DERIVED FROM INVERTEBRATES.

a. Insect productions:

Silk-worm "gut" used in making leaders for fish-lines.

(Nest of Cayenne-ant, (*Formica bispinosa*,) used as a mechanical styptic.)

Spiders' web used as a mechanical styptic and for the cross-lines in optical instruments, (see, also, under D, 8.)

Papier-maché of hornets' nests used for gun-wadding.

b. Mollusk productions:

Byssus of mollusks, (see under D, 8.)

26. SPONGES.

a. Specimens of American commercial sponges, with the different grades, and bleached sponges:

(Specimens of Mediterranean sponges.)

Surgical apparatus, probangs, aurilaves, "sponge-tents," and other instruments manufactured.

Spongeo-piline used as a substitute for poultices.

Sponges used in stuffing mattresses and cushions.

27. OILS AND FATS.

a. Mammal oils:

Bear-oil and bear-fat used as a cosmetic and in the manufacture of pomatums.

Dog-oil used in the manufacture of kid-gloves.

Seal-oil, in its various grades, used for lubricating.

Sea-elephant oil.

Sea-lion oil.

Manatee-oil.

Dugong-oil.

Oil and fat from domestic animals, tallow, suet, lard, lard-oil used in lamps, for lubricating, and neats-foot oil used in dressing leather, also manufactured into various substances, (see D, 30,) and tallow candles and night-lights.

Oil from body of whales, grampuses, and porpoises used in the arts, for lubricating, painting, &c.

Black-fish and porpoise-jaw oil used in lubricating fine machinery, watches, clocks, and guns, with specimens of blubber.

Grampus-oil used for lubricating fine machinery.

Sperm-oil used in lamps, for lubricating, as an emollient in medicine, for lip-salves, and in the manufacture of spermaceti.

Manufactured glycerines, used as a preservative and antiseptic, as a cosmetic, as an emollient, as a substitute for cod-liver oil, in the manufacture of perfumes and hair-dressings, in photography, in the manufacture of nitro-glycerine, dynamite, dualine, lithofracteur, coloniamite, and other explosives, soap, &c.

Manufactured stearines, with candles and other manufactured articles.

Soaps manufactured from mammal-oil, soda-soaps, (hard, toilet, and resin soaps,) potash-soaps, (washing, shaving, and soft soaps,) diachylon plaster, &c.

Spermaceti, with specimens of candles.

Butter made from milk of cows, goats, and horses.

Oleomargarines, with specimens of imitation butter.

Brains of buffalo used in tanning by Indians.

b. Bird-oils:

(Oils of petrels and other sea-birds used by Eskimos and in the Azores for lamp-oil.)

27. OILS AND FATS—Continued.

b. Bird-oils:

Goose-oil used by watch-makers, and as an emollient.

(Oil of guacharo, (*Steatornis caripensis*,) used in South America as food.)

(Ostrich used for food, and by the Arabs in medicine, and emu-oil used in Australia in medicine.)

(Oil of penguin, (*Diomedea chilensis*,) of Falkland Islands, sold in London for currying leather.)

(Peacock's fat and oil.)

(Oil of mutton-bird, (*Procellaria obscura*,) of Bass's Straits, used for lamp-oil illuminating.)

(Oil of frigate-bird, (*Tachypetes aquila*,) sometimes used in medicine.)

Oil of pigeon, (*Ectopistes migratorius*,) used as food by Indians and frontiersmen.

(Fulmar-oil from island of Saint Kilda.)

c. Reptile oils:

Alligator-oil manufactured in Florida.

(Alligator-oil used by South American Indians, mixed with chica pigment for painting their bodies.)

Turtle-oil made from turtle-eggs, used in dressing leather and in manufacture of soap.

Rattlesnake and other snake oils.

d. Fish-oils:

Sun-fish oil used by fishermen for cure of rheumatism.

Cod-oil, also cod-liver oil used in medicine, as a food and emollient, and in lubricating.

Hake and haddock liver oil used in adulterating cod-liver oil.

(Pollock-oil used by Shetlanders for illumination.)

Menhaden-oil used in currying leather, in rope making, for lubricating, for adulterating linseed-oil, as a paint-oil, and exported to Europe for use in the manufacture of soap and for smearing sheep.

Herring-oil.[1]

White-fish oil.[1]

Sturgeon-oil.[1]

([1] NOTE.—These oils, with other oils made from fishes, and a large part of the seal and "black" whale oil, are known indiscriminately as fish-oil and used chiefly for the purposes enumerated under the head of menhaden-oil.)

27. OILS AND FATS—Continued.

d. Fish-oils:

Oulachan oil used by Indians of Northwest coast for food and illumination.

Shark and skate liver oil, including the "Rouen oil," made on the coast of Normandy from the livers of *Raia aquila*, *R. pastinaca*, and *R. batis*, used like cod-liver oil.

Cramp-fish oil used by fishermen for cure of rheumatism.

Soaps made from fish-oil.

28. PERFUMES.

a. Mammal perfumes:

(Civet of the civet-cat (*Viverra civetta*) of Africa.)

(Civet of the rasse (*Viverra rasse*) of Java.)

(Zibeth civet of the Zibeth (*Viverra zibetha*) of Indian Archipelago.)

(Musk from musk-deer, (*Tragulus*, sp. var.,) in its various grades, of Tonquin or Thibet, and, Kabardin, Russian, or Siberian musk.)

Musk of musk-ox.

Musk of the musquash.

Castoreum of the beaver, including the various commercial grades, the Canadian, Hudson's Bay, and Russian castoreum, and specimens of castorine.

(Hyraceum of the daman, (*Hyrax capensis.*))

Ambergris of sperm-whale, with specimens of ambreine.

b. Reptile perfumes:

Musk of alligator.

Oil of hawksbill and loggerhead turtles, used in perfumery.

29. COLORING MATERIALS.

a. Derived from mammals:

Bone-black.

Ivory-black, (*noire d'ivoire.*) used in fine painting, and in the manufacture of bank-note ink.

Prussiates, prussian-blue, ferrocyanide of potassium, made from hoofs and refuse human and other hair.

Gall of animals used in dyeing.

Dung of animals used in calico-printing.

Hæmatin made from blood, and used in turkey-red dye-works, and for the red liquor of printers.

Wool-flocking. (See under D. 21.)

29. COLORING MATERIALS—Continued.

b. Derived from birds:

Shell of eggs, used for white pigment.

Series of murexides, or purpurate of ammonia dyes, made from guano.

c. Derived from fishes:

(*Essence d'Orient*, or fish-scale pearl, used as a pigment.)

(Gall of carp, used in Turkey as a green paint and in staining paper.)

d. Derived from insects:

(Cochineal dye, from *Coccus cacti* of Mexico, used in manufacture of rouge, of carmine, and lake pigments, and in coloring tinctures.)

Canadian cochineal.

(Kermes(and other cochineals of commerce, *Coccus ilicis.*)

(Lac dye and lac lake, from *Coccus lacca*, *C. polonicus*, *C. uva ursi*, and *Ophis fabæ.*)

Dye prepared from bed-bug, (*Cimex lectularius.*)

(Dye prepared from *Trombidium*, in Guinea and Surinam.)

Nut-galls produced by insects, and used in tanning, for black dyes, for woolen cloth, silk, and calico, and in manufacture of ink and gallic and pyrogallic acid, employed in photography.

e. Derived from mollusks:

(*Sepia* from *Sepia officinalis.*)

Purple dyes from gastropods, *Murex*, *Purpura*, &c.

Purple dyes from nudibranch mollusks.

30. CHEMICAL PRODUCTS AND AGENTS EMPLOYED IN ARTS AND MEDICINE.

a. Derived from mammals:

Secretion of skunk.

Album græcum of dogs, used as a depilatory in tanning hides.

Albumen of blood, employed in sugar-refineries, in certain cements and pigments, and as antidote and emollient.

Dung, used in calico-printing.

Gall of animals, used in mixing colors, in fixing the lines of crayon and pencil drawings, in preparing the surface of ivory for painting, in removing grease, and in medicine.

Pepsine and pancreatine, prepared from stomachs of hogs and calves.

30. CHEMICAL PRODUCTS, &c.—Continued.

a. Derived from mammals:

(Koumiss, a fermented liquor, prepared from mare's and cow's milk, and employed in medicine.)

Phosphorus, prepared from bones, with specimens of matches, vermin poisons, and other products.

Vaccine lymph, derived from cows.

Ammonia, prepared from bones and horn.

Sal ammoniac, prepared from bones and dung.

Prussiates, prepared from hoof, horn, and leather waste, dried blood, hair, and wool, with specimens of blue cyanide of potassium.

Lime from bones and bone phosphates. See also under 32.

Punk and tinder, made from droppings of camel and bison.

Animal charcoal, used as a decolorizer.

b. Derived from birds:

Albumen of eggs, used in photography, in clarifying liquors, by physicians as emollients and antidotes, and by apothecaries in suspending oils and other liquids in water.

Egg-shells, employed as an antacid.

c. Derived from reptiles:

Crotalin of rattlesnake and copperhead.

(*Scincus officinalis* of Egypt, used by European practitioners as sudorific and stimulant.)

d. Derived from fishes:

Propylamine, made from fish-brine.

(Intestines of grayling, used by Laplanders as a substitute for rennet.)

Skins of eels, used by negroes for rheumatism.

e. Derived from insects:

Vesicatory preparations from American beetles, *Cantharis cinerea* and *C. vittata*.

(Vesicatory preparations derived from foreign beetles, cantharides or Spanish flies, (*Cantharis vesicatoria*,) and other species, and substitutes *Mylabris cichorii*, *Cercoma Schoefferi*, *Meloe*, sp. var., &c.)

Vesicatory preparations from American spiders, such as *Tegenaria medicinalis*.

Gall-nuts, used in medicine. (See under 29.)

30. CHEMICAL PRODUCTS, &c.—Continued.

e. Derived from insects:

Coccinella, used as a remedy for toothache.

(Trehala, made from nests of beetles, (*Larinas nidificans*,) of East Indies, and used as a substitute for tapioca.)

Formic acid.

Carbazotic acid and its derivatives, made from sewing silk scraps, and used as a substitute for quinine.

Beeswax, used in manufacture of candles, cerates, plasters, and artificial flowers, in modeling and casting, and in medicine.

Honey, used as a preservative, a food, and in medicine as an aperient and demulcent.

(Wax, used in Chinese pharmacy, secreted by the *Coccus pehlah.*)

(Manna, produced by punctures of *Coccus manniparus.*

a′. Manna from the *Tamarix mannifera*, used as food, and in medicine as a purgative.

b. Cedar manna of Mount Lebanon, from *Pinus cedrus.*

c. Arabian manna, from *Hedysarum alliagi.*)

(Eye-powder, made by Chinese from the Telini fly, (*Mylabris cichorii*,) of India.)

f. Derived from crustacea:

Salve-bug of fishermen of Banks, (*Caligus curtus*,) parasite on cod-fish.

Crabs' eyes, or concretions from stomach of astacus, used as an antacid.

g. Derived from worms:

American leech, (*Macrobdella decora*,) used in surgery.

(European leech, (*Hirudo medicinalis*,) introduced into America.)

(African leech, (*Hirudo trochina*,) introduced.)

Leeches used as barometers.

h. Derived from mollusks:

(Cuttle-fish bone of *Sepia officinalis.*) (See under D, III, H.)

Calcined shells, used for building-lime, and in manufacture of dentifrices and enamel. (See under III, H.)

i. Derived from radiates:

a. Limes, derived from calcining coral and coral rock.

30. CHEMICAL PRODUCTS, &c —Continued.
  k. Derived from protozoans:
    Burnt sponge, formerly used in medicine.
    Infusorial earth, and its applications. (See above, under K.)
31. FERTILIZERS.
  a. Natural guanos:
    Bat guano from caves.
    Bird guano from oceanic islands.
  b. Artificial guanos:
    Menhaden guano.
    Herring guano.
    White-fish guano.
    Other fish guano.
  c. Artificial fertilizers:
    Bone-dust ground for use.
    Bone phosphates.
    Dried meat from refuse of slaughter-houses.
    Poudrettes.
    Other animal fertilizers.
32. LIMES. (See under 30.)
33. OTHER MATERIALS NOT MENTIONED.

SECTION E.

PROTECTION AND CULTURE.

I. INVESTIGATION.

1. METHODS OF THE UNITED STATES FISH COMMISSION.

- *a.* Methods of work:
  - Apparatus for collecting specimens, (see under B.)
  - Apparatus for physical research.
  - Appliances for working up results.
  - (This should include a model of coast laboratory with all its fittings.)
- *b.* Results of work:
  - Publications of the commission.
  - Collections, (see under A, V to VIII.)
  - Photographs, &c.

II. PROTECTION

2. PRESERVATION OF GAME, FISH, &c.:

* *From man.*

- *a.* Game laws.

** *From artificial obstructions.*

- *b.* Fish-ways:[1]
  - Gap fish-ways.
  - Trench, ditch, or "Cape Cod" fish-ways.
  - Oblique grove fish-ways:
    - Single groove.
    - Brewer's.
    - Mather's.
  - Step fish-ways:
    - Box or pool fish-ways:
      - Overflowing, (old style.)
      - With passage-way cut down to the floor, (Smith's.)
      - With passage-way submerged, (Cail's.)
    - With contracting galleries, (Pike's.)
    - With transverse-sloping floors, (Steck's.)

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[1] Classification proposed by C. G. Atkins.

2. PRESERVATION OF GAME, FISH, &c.—Continued.
    - *b.* Fish-ways:
        - Steps contrived by arrangement of rocks and bowlders.
        - Inclined plane without steps:
            - Plain, (Pennsylvania.)
        - With partitions at right angles:
            - "Rectangular compartment."
            - Brackett's.
        - With oblique partitions:
            - Foster's.
            - Swazey's.

*** *From natural enemies.*

- *c.* Apparatus for destroying injurious species:
    - Oyster-bed tangles, (see under B, 12.)

3. CARE OF ANIMALS IN CAPTIVITY.
    - *a.* Tethers and hopples.
    - *b.* Cages and pens:
        - Kennels for dogs, &c.
        - Cages for animals.
        - Cages for birds.
        - Cages for insects.
        - (West India fire-fly trap.)
    - *c.* Fish-cars and other floating-cages for aquatic animals.
    - *d.* Aquaria:
        - Globes.
        - Aquaria.
    - *e.* Hives and other cages for insects.
    - *f.* Live-boxes, troughs, &c., for microscopists' use.
    - *g.* Fish-ponds, fish-farms, (models.)
4. ENEMIES OF USEFUL ANIMALS.
    - *a.* Intestinal worms and other internal parasites.
    - *b.* Fish-lice, barnacles, and other external parasites.
    - *c.* Predatory animals not elsewhere exhibited.

III. PROPAGATION.

5. PROPAGATION OF MAMMALS.
    - *a.* Methods of mink culture.
    - *b.* Methods of culture of domesticated animals.

6. PROPAGATION OF BIRDS.
   - *a.* Methods of ostrich culture.
   - *b.* Methods of culture of domesticated birds, fowls, &c.

7. PROPAGATION OF REPTILES.
   - *a.* Methods of terrapin culture.

8. PROPAGATION OF AMPHIBIANS.
   - *a.* Methods of frog culture.

9. PROPAGATION AND CULTURE OF FISHES.[1]
   - *a.* Accessories of obtaining and impregnating ova:
     - Pans, pails, &c.
     - Strait-jackets used in spawning salmon.
     - Spawning-race, (Ainsworth.)
     - Roller-spawning screen, (Collins.)
     - Spawning-vat, (Bond.)
   - *b.* Hatching-apparatus:
     - Troughs:
     - Plain.
     - Gravel-bottomed.
     - With sieve-bottom trays:
       - Brackett's.
       - Williamson's.
       - Clark's.
     - Vats or cases:
       - Holton's.
       - Roth's.
       - Glass-grilled boxes, (Coste's.)
     - Jars and tin-vessels:
       - Bell and Mather's.
       - M. A. Green's.
       - Ferguson's.
       - Chase's.
     - Hatching-boxes, (floating:)
       - Seth Green's shad-box.
       - Brackett's shad-box.
       - Brackett's shad-box, (No. 2.)
       - Bryant's shad-box.
       - Stilwell & Atkins's shad-box.
       - Bannister's shad-box.

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[1] Classification proposed by J. W. Milner.

9. PROPAGATION AND CULTURE OF FISHES—Continued.

- *b.* Hatching-apparatus:
  - Hatching-boxes, (floating:)
    - Adhesive eggs apparatus:
      - Vertical wire-cloth trays.
      - Hatching-basket.
  - Brook shanty, (Furman's.)
  - (Bay or cove barriers, Professor Rasch's.)
  - Accessories:
    - Tanks.
    - Nests.
    - Trays.
    - Grilles.
    - Gravel-filters.
    - Flannel screens.
    - Shallow troughs or tables (for picking eggs.)
    - Egg-nippers.
    - Cribbles.
    - Pipettes.
    - Skimmer-nets.
    - Feathering quills and brushes.
    - Rose-nozzles, (for washing eggs.)
    - Syringes, bulb, &c.
    - Shallow pans.
    - Aerating-pipe.
- *c.* Transporting apparatus:
  - Apparatus for transporting eggs:
    - Cans.
    - Case of cups, (Wilmot's.)
    - Case of cups, (Clark's.)
    - Case of trays, (Clark's.)
    - Moss-crates, (Stone's.)
  - Apparatus for transporting fish:
    - Barrels.
    - Cans, plain.
    - Cans with aerating accessories:
      - Slack's.
      - Clark's.
      - Creveling.
      - M. A. Green's.

9. PROPAGATION AND CULTURE OF FISHES—Continued.
    - *c.* Transporting apparatus:
        - Apparatus for transporting fish:
            - Tanks with aerating accessories:
            - Tanks, with attachment of band-wheel to car-axle, (Stone's.)
            - (Tanks, with Freiburg aerating apparatus.)
            - Aquarium-car, (Stone's.)
            - Live-box, (Atkins's.)
            - Accessories:
                - Air force-pumps.
                - Siphons.
                - Siphon-tubes.
                - Bellows.
                - Roses, aerating.

10. PROPAGATION OF INSECTS.
    - *a.* Propagation of silk-worm:
        - Specimens of plants used for food.
        - Model of house and its appliances.
    - *b.* Propagation of cochineal insect.
    - *c.* Propagation of bees:
        - For hives, (see under E. 3.)

11. PROPAGATION OF WORMS.
    - *a.* Propagation of leeches.

12. PROPAGATION OF MOLLUSKS.
    - *a.* Methods of oyster culture:
        - Stools for receiving spat, natural and artificial.
        - Other apparatus.

13. PROPAGATION OF CORALS.

14. PROPAGATION OF SPONGES.

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CLASSIFICATION

OF THE

COLLECTION TO ILLUSTRATE

THE

ANIMAL RESOURCES OF THE UNITED STATES.

A LIST OF SUBSTANCES DERIVED FROM THE ANIMAL KINGDOM, WITH
SYNOPSIS OF THE USEFUL AND INJURIOUS ANIMALS
AND A CLASSIFICATION OF THE METHODS
OF CAPTURE AND UTILIZATION.

By G. BROWN GOODE, M. A.,
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